HP StorageWorks

EVA iSCSI Connectivity User Guide

Part Number: 5697-0511
Thirteenth edition: August 2010

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About this guide

This user guide provides information to help you:

- Install the Enterprise Virtual Array (EVA) or EVA4400 iSCSI connectivity option
- Install an additional EVA or EVA4400 iSCSI connectivity option for high availability
- Configure EVA or EVA4400 iSCSI connectivity multipath software
- Install software initiators for different operating systems
- Configure EVA iSCSI LUNs using HP Command View EVA
- Configure the mpx100 or mpx100b

This section contains the following topics:

- Overview, page 17
- Conventions, page 18
- HP technical support, page 19
- Subscription service, page 19
- Other HP web sites, page 20

Overview

This section contains the following topics:

- Intended audience, page 17
- Related documentation, page 17

Intended audience

This guide is intended for system administrators with knowledge of:

- HP StorageWorks EVA4x00/6x00/8x00 or EVA3000/5000 storage systems
- Configuring LUNs using HP Command View EVA
- HP Fibre Channel Storage Area Networks (SANs)
- TCP/IP networking
- iSCSI

Related documentation

The following documents provide related information:

- *HP StorageWorks EVA iSCSI connectivity quick start instructions for Windows*
- *HP StorageWorks iSCSI Connectivity Option for EVA release notes*
- *HP StorageWorks Command View EVA user guide*
- *HP StorageWorks Interactive Help for Command View EVA*
- *HP StorageWorks SAN design reference guide*

- *HP StorageWorks 4400 Enterprise Virtual Array user guide*
- *HP StorageWorks 4400 Enterprise Virtual Array installation guide*
- *HP StorageWorks 4000/6000/8000 Enterprise Virtual Array user guide*
- *HP StorageWorks Enterprise Virtual Array 3000/5000 user guide*
- *HP StorageWorks Replication Solutions Manager installation guide*

Document conventions and symbols

Table 1 provides the conventions and symbols used in this document.

Table 1 Document conventions

Convention	Element
Blue text: Table 1	Cross-reference links and email addresses
Blue, underlined text: http://www.hp.com	Web site addresses
Bold text	• Keys that are pressed • Text typed into a GUI element, such as a box • GUI elements that are clicked or selected, such as menu and list items, buttons, tabs, and check boxes
Italic text	Text emphasis
`Monospace` text	• File and directory names • System output • Code • Commands, their arguments, and argument values
`Monospace, italic` text	• Code variables • Command variables
`Monospace, bold` text	Emphasized monospace text, including file and directory names, system output, code, and text entered at the command line.

⚠ WARNING!

Indicates that failure to follow directions could result in bodily harm or death.

△ CAUTION:

Indicates that failure to follow directions could result in damage to equipment or data.

IMPORTANT:

Provides clarifying information or specific instructions.

NOTE:

Provides additional information.

TIP:

Provides helpful hints and shortcuts.

Rack stability

Observe the following rack stability warning to protect personnel and equipment.

WARNING!

To reduce the risk of personal injury or damage to equipment:

- Extend leveling jacks to the floor.
- Ensure that the full weight of the rack rests on the leveling jacks.
- Install stabilizing feet on the rack.
- In multiple-rack installations, fasten racks together securely.
- Extend only one rack component at a time. Racks can become unstable if more than one component is extended.

HP technical support

Telephone numbers for worldwide technical support are listed on the HP support website: http://www.hp.com/support/.

Collect the following information before calling:

- Technical support registration number (if applicable)
- Product serial numbers
- Product model names and numbers
- Error messages
- Operating system type and revision level
- Detailed questions

For continuous quality improvement, calls may be recorded or monitored.

Subscription service

HP strongly recommends that customers register online using the Subscriber's choice website: http://www.hp.com/go/e-updates.

Subscribing to this service provides you with email updates on the latest product enhancements, newest driver versions, and firmware documentation updates as well as instant access to numerous other product resources.

After subscribing, locate your products by selecting **Business support** and then **Storage** under Product Category.

Other HP websites

For additional information, see the following HP websites:

- http://www.hp.com
- http://www.hp.com/go/storage
- http://www.hp.com/service_locator
- http://www.docs.hp.com

1 Overview of the EVA and EVA4400 iSCSI connectivity option

This chapter contains the following topics:

- EVA and EVA4400 iSCSI connectivity product description, page 21
- EVA and EVA4400 iSCSI connectivity options, page 22
- EVA and EVA4400 iSCSI connectivity hardware and software support, page 26
- Security, page 30
- Configuring HP StorageWorks Continuous Access EVA and Business Copy, page 30

EVA and EVA4400 iSCSI connectivity product description

The EVA family of Fibre Channel (FC) storage systems is supported for integrated iSCSI connectivity using the iSCSI connectivity option. The connectivity option uses the mpx100 (all EVA models) or mpx100b (EVA4400 and EVA4400 with embedded switch) hardware and HP Command View EVA management software. This option is available factory-integrated from HP or as a field upgrade to an existing EVA storage system. With this option, iSCSI connectivity to the EVA is provided for servers through a standard Gigabit Ethernet (GbE) network interface controller (NIC).

NOTE:

The EVA iSCSI connectivity option (mpx100) is supported with EVA4000/4100/4400/4400 with embedded switch /6000/6100/8000/8100, EVA6400/8400 and EVA3000/5000 storage systems. The EVA4400 iSCSI connectivity option (mpx100b) is supported with EVA4400/4400 with embedded switch storage systems.

Contact an HP storage representative for the latest support information.

Table 2 lists the part numbers required to configure various EVA iSCSI connectivity options. For a complete list of the components included in each option, see Table 12 on page 42.

Table 2 iSCSI Fibre Channel attachment option part numbers

Part No.	Option name	Order with:	Option includes:
AE324A	HP StorageWorks EVA iSCSI Connectivity Option	An EVA storage system or order separately to upgrade an existing EVA	One mpx100 hardware unit and the components necessary to install in any EVA rack.

AE352A	HP StorageWorks EVA iSCSI Upgrade Option (optional)	The AE324A connectivity option and an EVA storage system to provide high-availability multipath connectivity or to upgrade an existing EVA with iSCSI connectivity for multipath	A redundant mpx100 hardware unit for customers who require high availability.
AJ713A	HP StorageWorks EVA4400 iSCSI Connectivity Option	An EVA4400 storage system or to upgrade an existing EVA4400	One mpx100b hardware unit and the necessary components to install in any EVA rack. Supports up to 16 iSCSI initiators.
AJ714A	HP StorageWorks EVA4400 iSCSI Upgrade Option (optional)	The AJ713A connectivity option and an EVA4400 storage system to provide high availability multipath connectivity, or order separately to upgrade an existing EVA4400 with iSCSI connectivity for multipath.	A redundant mpx100b hardware unit for customers who require high availability. Supports up to 16 iSCSI initiators.
T5471A	HP StorageWorks EVA4400 iSCSI Connectivity 32 Initiator Upgrade License (LTU) (optional)	For use with the EVA4400 and mpx100b only.	Install one upgrade license to increase the number of iSCSI Initiators from 16 to 48. Install a second upgrade license to increase the number of iSCSI Initiators from 48 to the maximum supported limit of 150.

The following additional equipment is required to configure the EVA or EVA4400 iSCSI option for fabric iSCSI–Fibre Channel attachment mode:

- B-series, C-series, or M-series Fibre Channel switch
- Optical small form-factor pluggables (SFPs)
- Optical Fibre Channel cables

Contact your HP storage representative for specific switch model support.

EVA and EVA4400 iSCSI connectivity options

An EVA storage system can be configured for simultaneous connectivity to iSCSI and Fibre Channel attached hosts. Support for iSCSI is provided through a dedicated EVA host port (direct connect) or shared with Fibre Channel through an existing fabric host port (fabric attach).

Figure 1 illustrates the direct connect iSCSI–Fibre Channel attachment mode configuration. This configuration is used with an EVA 4000/4100/6x00/8x00 storage system. Figure 2 illustrates the direct connect iSCSI-Fibre Channel attachment mode for an EVA4400 storage system.

NOTE:

Direct connect mode requires a dedicated host port on each HSV controller. Unused controller host ports require loop-back connectors. See Table 12 on page 42 for more information.

Discovery IP Address	Presented iSCSI Targets
D1	FP1B
	FP1A

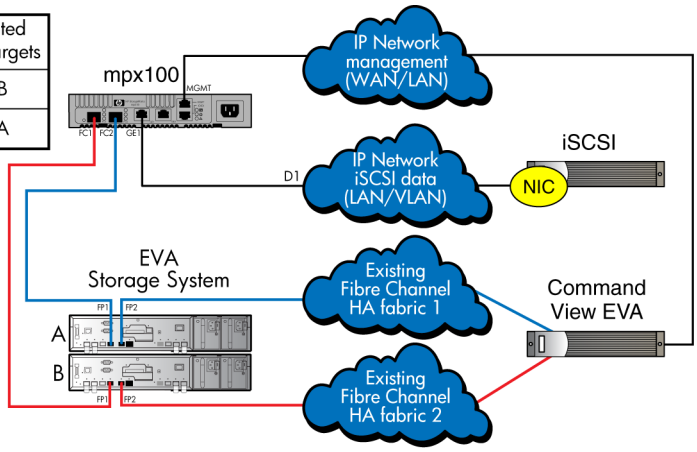


Figure 1 Direct connect iSCSI-Fibre Channel attachment mode configuration

Discovery IP Address	Presented iSCSI Targets
D1	FP1A
	FP1B
D2	FP1A
	FP1B
D3	FP1A
	FP1B
D4	FP1A
	FP1B

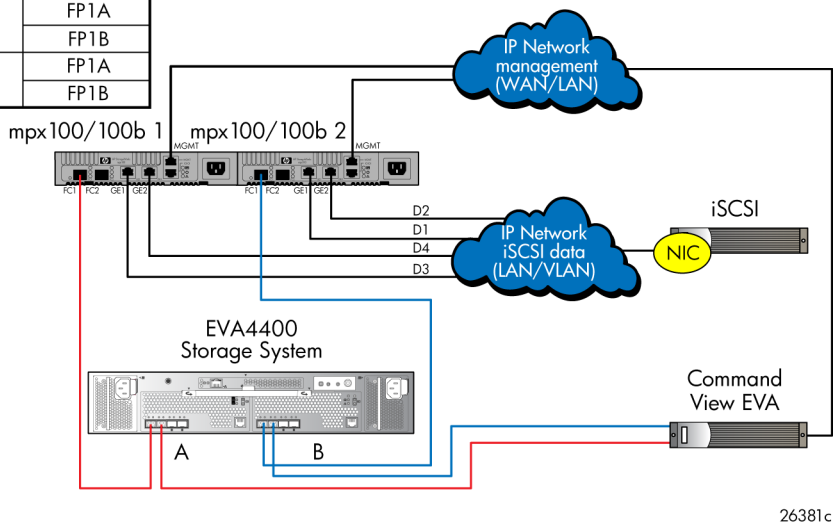


Figure 2 EVA4400 direct connect iSCSI-Fibre Channel attachment mode configuration

Figure 3 and Figure 4 illustrate the HP Command View EVA iSCSI deployment configurations. These configurations are used with EVA 4x00/6x00/8x00 storage systems and allow for HP Command View connectivity without the need for a Fibre Channel switch. Figure 4 shows a redundant configuration using two mpx100/100b's.

An EVA4400 with an ABM module can be configured with direct connections as an iSCSI-only solution. See Figure 5.

Discovery IP address	Presented iSCSI targets
D1	FP1B
	FP1A

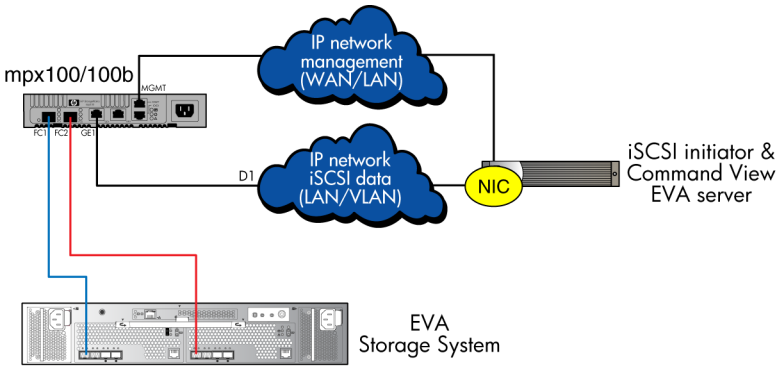


Figure 3 HP Command View EVA deployment configuration 1

Discovery IP Address	Presented iSCSI Targets
D1	FP2A
	FP2B
D2	FP2A
	FP2B
D3	FP1A
	FP1B
D4	FP1A
	FP1B

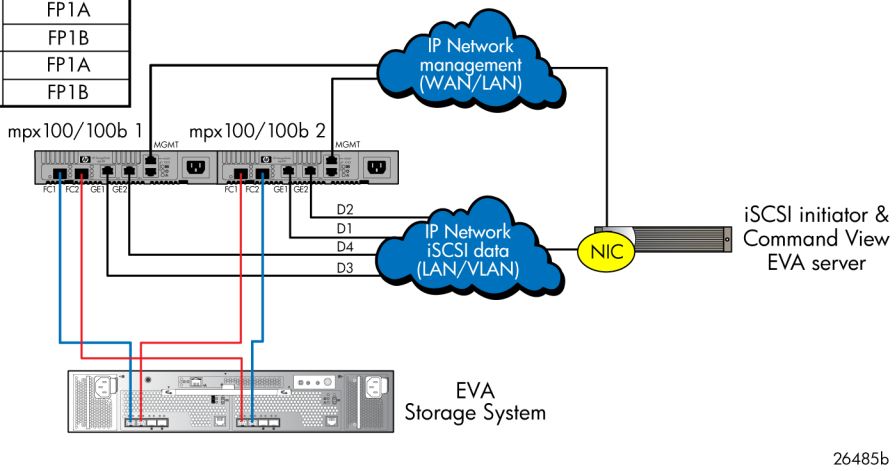


Figure 4 HP Command View EVA deployment configuration 2

Discovery IP Address	Presented iSCSI Targets
D1	FP2A
	FP2B
D2	FP2A
	FP2B
D3	FP1A
	FP1B
D4	FP1A
	FP1B

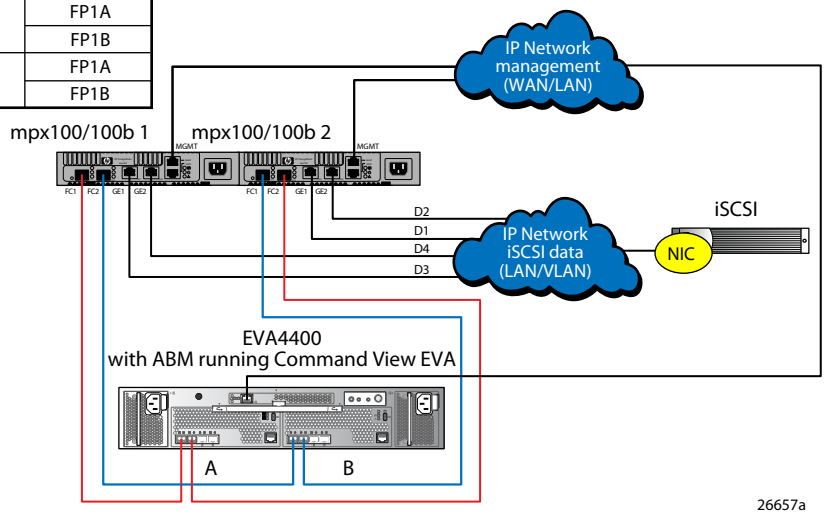


Figure 5 EVA4400 direct connect iSCSI-Fibre Channel attachment mode ABM configuration

Figure 6 illustrates the EVA8x00 mpx100 and Windows host direct-connect only iSCSI–Fibre Channel attachment mode. This configuration is used with EVA4x00/6x00/8x00 storage systems that have all controller host ports configured for direct connect mode.

Discovery IP Address	Presented iSCSI Targets
D1	FP2A
	FP2B
D2	FP2A
	FP2B
D3	FP1A
	FP1B
D4	FP1A
	FP1B

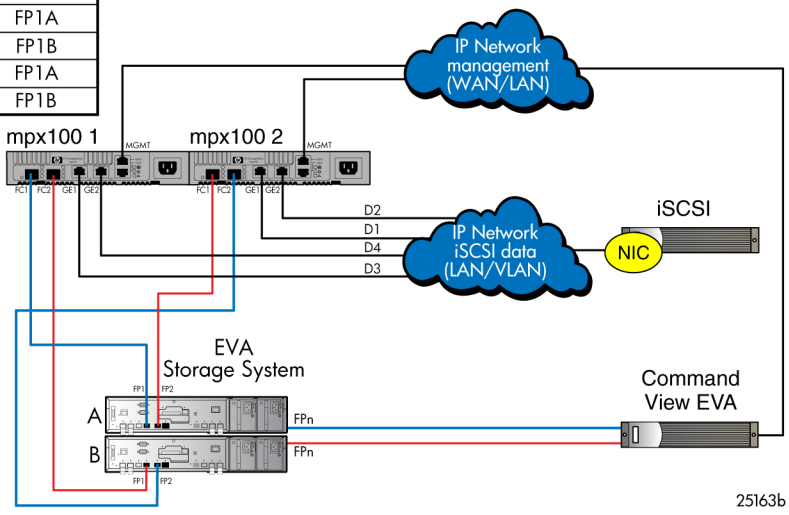


Figure 6 EVA8x00 mpx100 and Windows host direct-connect only

Figure 7 illustrates the fabric iSCSI–Fibre Channel attachment mode configuration. This configuration is used with EVA3000/5000 and EVA4x00/6x00/8x00 storage systems with mpx100, and with EVA4400 using mpx100b.

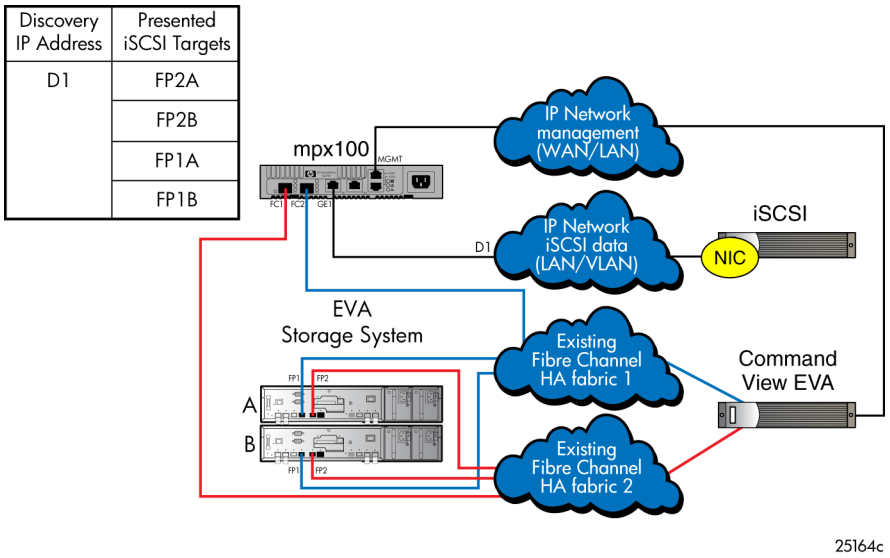


Figure 7 Fabric-iSCSI-Fibre Channel attachment mode

EVA and EVA4400 iSCSI connectivity hardware and software support

This section identifies the hardware, devices, and operating systems compatible with the mpx100/100b.

Hardware support

mpx100/100b data transport

The EVA and EVA4400 iSCSI options support both direct connect and Fibre Channel fabric connectivity through the mpx100/100b to the EVA storage system.

Table 3 shows the connectivity attachment mode supported, based on the EVA storage system model.

Table 3 Connectivity attachment mode supported

EVA storage system	Storage software version	iSCSI–Fibre Channel attachment mode
EVA4400	For the latest information on storage software version support, see the product release notes or the Single Point of Connectivity Knowledge (SPOCK) at http://www.hp.com/storage/spock. You must sign up for an HP Passport to enable access.	The mpx100b direct connect (Figure 2 on page 23)[1]
		The mpx100b fabric through a Fibre Channel switch (Figure 7)
EVA4400 with embedded switch		The mpx100b fabric through the embedded Fibre Channel switch
EVA4000/4100/6100/8000/8100EVA6400/8400		The mpx100 direct connect (Figure 1 on page 23)[1]
		The mpx100 and Windows host direct connect only (Figure 6 on page 25). All controller host ports are direct connect.

		The mpx100 fabric through a Fibre Channel switch (Figure 7)
		The mpx100 fabric through a Fibre Channel switch (Figure 7)

[1]A Fibre Channel switch is not required for the mpx100 and Windows host direct connect or HP Command View EVA iSCSI deployment. See Figure 1, Figure 2, Figure 3, Figure 4, and Figure 6 for more information.

Fibre Channel switch hardware support

The EVA and EVA4400 iSCSI options are supported with most B-series, C-series, and M-series product line switches. Contact an HP storage representative for the latest information about support for specific switch models.

Storage systems

The mpx100 is supported with the EVA4000/4100/4400/4400 with embedded switch/6x00/8x00 and EVA3000/5000 storage systems. The mpx100b is supported with the EVA4400/4400 with embedded switch storage systems.

Software support requirements

For the latest information on software support, see the product release notes or SPOCK at http://www.hp.com/storage/spock. You must sign up for an HP Passport to enable access.

Management software requirements

- Command View 9.0.1 or later is required for EVA6400/8400.
- HP Command View EVA 8.1 or later is required for array-based anagement (ABM).
- HP Command View EVA 8.0.1 or later is required for EVA4400 with embedded switch.
- HP Command View 8.0x or later is required for the mpx100/100b running firmware version 2.4x or later.
- The EVA iSCSI Connectivity Options support Command View EVA iSCSI connectivity (Fibre Channel switch not required). See "Command View EVA management rules and guidelines" on page 39.
- HP StorageWorks mpx Manager GUI is required for mpx100/100b management.

Multipath software requirements

Table 4 lists the operating system multipathing requirements for EVA storage systems.

Table 4 Multipathing software requirements

Operating system	Storage system	EVA software version	Windows MPIO

Microsoft Windows 2008	EVA 3000/5000 (active/active, fabric attach only) EVA4000/4100/4400/4400 with embedded switch /6000/6100/8000/8100, EVA6400/8400	For the latest information on EVA software version support, see the product release notes or SPOCK at http://www.hp.com/storage/spock. You must sign up for an HP Passport to enable access.	Windows MPIO
Microsoft Windows XP Professional			Fabric attach only
Linux			Device Mapper
OpenVMS			Native multipath support
Apple Mac OS X	EVA4000/4100/4400/4400 with embedded switch/6000/6100/8000/8100, EVA6400/8400		N/A
Solaris			Solaris MPxIO
VMware ESX			VMware MPxIO

Figure 8 illustrates the high-availability multipath direct connect iSCSI–Fibre Channel attachment mode configuration. This configuration is used with the EVA4000/4100/6x00/8x00 using the mpx100's and with the EVA4400 using the mpx100b's.

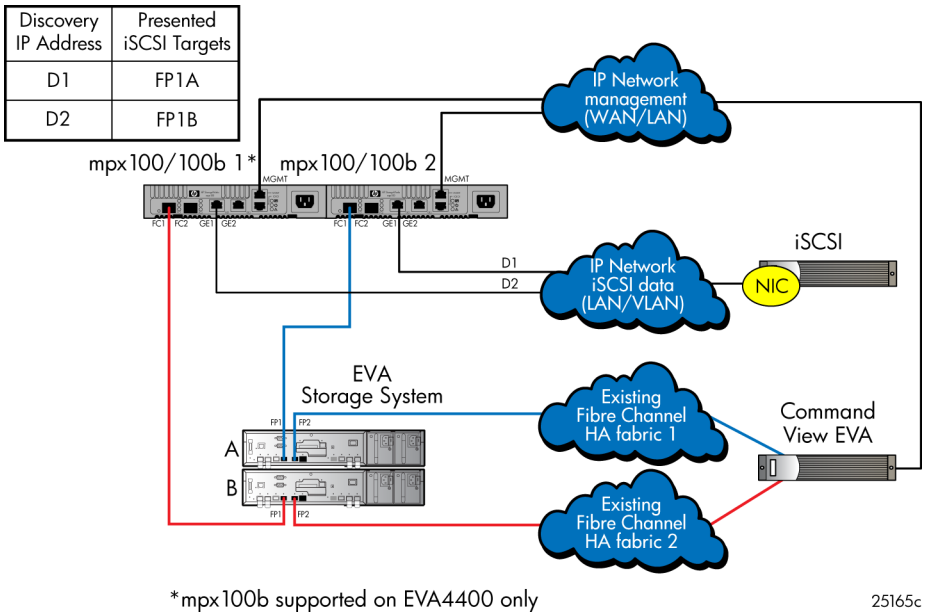


Figure 8 Multipath direct connect iSCSI-Fibre Channel attachment mode configuration

Figure 9 illustrates the high-availability multipath fabric iSCSI–Fibre Channel attachment mode configuration. This configuration is used with EVA4000/4100/6x00/8x00, with the mpx100s and with the EVA4400 using the mpx100b's.

Discovery IP Address	Presented iSCSI Targets
D1	FP1A
	FP1B
D2	FP2B
	FP2A

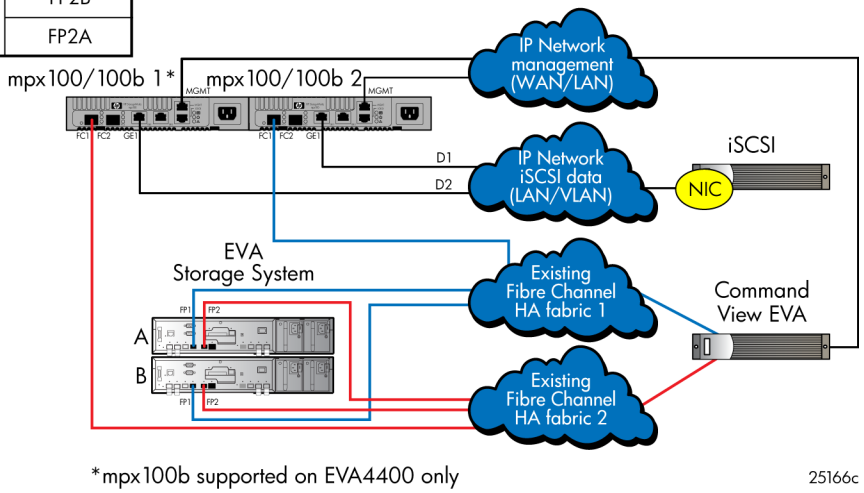


Figure 9 Multipath Fabric-iSCSI-Fibre Channel attachment mode configuration

NOTE:

Dual NICs and dual IP fabrics are supported for complete redundancy.

Figure 10 illustrates the high availability multipath fabric iSCSI–Fibre Channel attachment mode configuration with four iSCSI controller host ports. This configuration is used with EVA4000/4100/6x00/8x00 storage systems.

Discovery IP Address	Presented iSCSI Targets
D1	FP1A
	FP1B
D2	FP2A
	FP2B
D3	FP2A
	FP2B
D4	FP1A
	FP1B

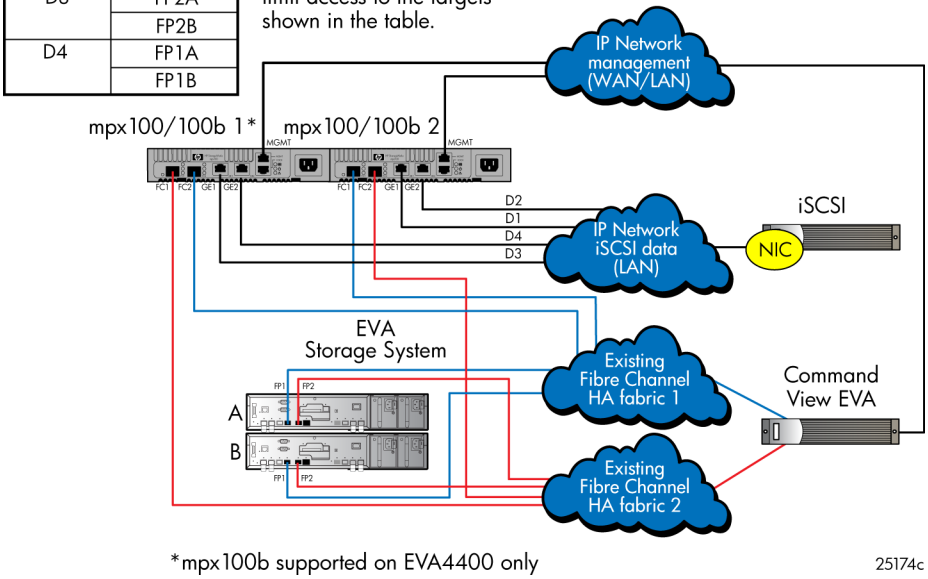


Figure 10 EVA4x00/6x00/8x00 fabric with four iSCSI-Fibre Channel controller host ports

Security

The mpx100/100b supports Challenge Handshake Authentication Protocol (CHAP) at the connection setup. CHAP is a security protocol that includes support for both the bidirectional (mutual) authentication and the one-way (target) authentication options. You can configure and set up CHAP in the mpx100/100b. The target mpx100/100b can have its own unique password for One-Way CHAP option. The initiator itself can have its unique password for the bidirectional CHAP option with the mpx100/100b target. See "CHAP restrictions" on page 208 for more information.

Configuring HP StorageWorks Continuous Access EVA and Business Copy

Currently supported EVA software applications for Fibre Channel hosts such as HP StorageWorks Continuous Access, Business Copy (BC), Storage System Scripting Utility (SSSU), and Replication Solutions Manager (RSM) are supported with the EVA iSCSI connectivity option. The limitations of using some of these applications on iSCSI hosts are discussed in Chapter 2, page 31.

2 Configuration rules and guidelines

This chapter discusses the rules and guidelines for the HP StorageWorks EVA and EVA4400 iSCSI connectivity option. This chapter contains the following topics:

- Operating system rules and guidelines, page 32
- EVA storage system rules and guidelines, page 37
- Fibre Channel switch/fabric rules and guidelines, page 39
- Command View EVA management rules and guidelines, page 39
- IP network rules and guidelines, page 39

EVA and EVA4400 iSCSI Connectivity option

This section contains information about limits, rules, and guidelines for the EVA and EVA4400 iSCSI Connectivity option, including:

- EVA and EVA4400 iSCSI connectivity option architectural design limits
- EVA and EVA4400 iSCSI connectivity option supported maximums
- General EVA and EVA4400 iSCSI connectivity rules
- Operating system rules and guidelines

EVA and EVA4400 iSCSI connectivity option architectural design limits

- Maximum of 256 connections per iSCSI port
- Maximum of 16 Fibre Channel targets (a target connected to both Fibre Channel (FC) ports is only counted once)

NOTE:

The architectural design limits listed do not constitute supported configurations.

EVA and EVA4400 iSCSI connectivity option supported maximums

Table 5 shows the supported mpx100 maximums.

Table 5 Supported mpx100 maximums

Description	Maximum per EVA or EVA4400 iSCSI connectivity solution
Hardware	
EVA storage system	1
mpx100/100b	2

Description	Maximum per EVA or EVA4400 iSCSI connectivity solution
Configuration	
Total number of iSCSI Initiators	1 mpx100—150 (single-path or multipath) 1 mpx100b—16 (base), 48 (license upgrade 1), 150 (license upgrade 2) Note that the mpx100/100b can serve both single-path and multipath LUNs concurrently.
Total number of iSCSI LUNs	150 LUNs maximum
Total number of iSCSI targets per initiator	8 (see Figure 10 on page 30)

General EVA and EVA4400 iSCSI connectivity rules

NOTE:

The EVA iSCSI connectivity option (mpx100) is supported with EVA4000/4100/4400/4400 with embedded switch /6000/6100/8000/8100, EVA6400/8400 and EVA3000/5000 storage systems. The EVA4400 iSCSI connectivity option (mpx100b) is supported with EVA4400/4400 with embedded switch storage systems.

Contact an HP storage representative for the latest support information.

- Each EVA storage system can have a maximum of two mpx100 or two mpx100b bridges.
- Each EVA controller host port can connect to a maximum of two mpx100/100b FC ports.
- Both mpx100/100b FC ports can connect only to the same EVA storage system.
- Each mpx100/100b FC port can connect to a maximum of one EVA port.
- Each iSCSI Initiator can have a maximum of eight mpx100/100b iSCSI targets.

Operating systems supported

Table 6 provides the operating system rules and guidelines.

Table 6 Operating systems

Operating system	Version	Cluster support
HP OpenVMS	For the latest information on operating system version support, see the product release notes or SPOCK at http://www.hp.com/storage/spock. You must sign up for an HP Passport to enable access.	OpenVMS Clusters
Apple Mac OS X		None
Microsoft Windows Server 2003		
Microsoft Windows XP		
Microsoft Windows 2008 Enterprise/Standard Editions		

Microsoft Windows Server 2008 Server Core		
Linux		
Sun Solaris 10		
VMware		

Initiator rules and guidelines

This section describes the following iSCSI Initiator rules and guidelines:

- "iSCSI Initiator rules and guidelines" on page 33
- "VMware iSCSI Initiator rules and guidelines" on page 33
- "Windows iSCSI Initiator rules and guidelines" on page 34
- "OpenVMS iSCSI Initiator rules and guidelines" on page 36
- "Apple Mac OS X iSCSI Initiator rules and guidelines" on page 35
- "Linux iSCSI Initiator rules and guidelines" on page 35
- "Solaris iSCSI Initiator rules and guidelines" on page 35

iSCSI Initiator rules and guidelines

This section describes iSCSI Initiator rules and guidelines.

- iSCSI Initiators and mpx100/100b iSCSI ports can reside in different IP subnets. This requires setting the mpx100/100b iSCSI gateway feature. See "Configuring the mpx100/100b" on page 51 and "Command line interface" on page 139 for more information.
- There can be a maximum of eight mpx100/100b iSCSI targets per iSCSI Initiator.
- Both single path and multipath initiators are supported on the same mpx100/100b.
- Fibre Channel LUNs and iSCSI LUNs are not supported on the same server.

VMware iSCSI Initiator rules and guidelines

Supports:

- Native iSCSI software initiator in VMware ESX 3.5
- Guest OS SCSI Controller, LSI Logic and/or BUS Logic (BUS Logic only with SUSE Linux)
- ESX server's native multipath solution, based on NIC teaming in the server
- Guest OS boot from mpx100/100b iSCSI device
- VMFS file system data stores and raw device mapping for guest OS virtual machines
- Multi-initiator access to the same LUN via VMFS cluster file system
- VMware ESX server supports multipath, using ESX server's native multipath solution based on NIC teaming

Does not support:

- BUS Logic Guest OS SCSI controller with Windows and/or Red Hat Linux
- EVA3000/5000

Supported by the EVA iSCSI option with VMware:

- Hardware iSCSI HBA
- NIC teaming
- VMware native iSCSI software initiator.
  See "Installing and upgrading EVA iSCSI connectivity" on page 41.

Network teaming

The EVA iSCSI option supports NIC teaming with VMware.

iSCSI Initiator software

The EVA iSCSI option supports the VMware native iSCSI software Initiator. See "Installing and upgrading EVA iSCSI connectivity" on page 41 for information on version support.

Windows iSCSI Initiator rules and guidelines

Windows requirements

- Microsoft Windows 2008 bundled iSCSI Initiator, Windows 2003 iSCSI Initiator versions 2.06, 2.07
- The TCP/IP parameter `Tcp1323Opts` must be entered in the registry with a value of `DWord=2` under the registry setting`# HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Tcpip\Parameters.`

NOTE:

This parameter is set automatically by the *HP StorageWorks iSCSI Connectivity Option for Enterprise Virtual Array Windows software kit*. This kit is available at http://h18006.www1.hp.com/products/storageworks/evaiscsiconnect/index.html

CAUTION:

Using the Registry Editor incorrectly can cause serious problems that may require reinstallation of the operating system. Backup the registry before making any changes. Use Registry Editor at your own risk.

Windows iSCSI Initiator multipath requirements

The following system requirements must be met in Windows:

- The iSCSI Initiator multipath in Windows supports the Microsoft iSCSI MPIO device
- The iSCSI Initiator multipath in Windows supports multipath on single or dual mpx100's/100b's.
- The iSCSI Initiator multipath in Windows does not support:
  - Secure Path
  - Multipathing with EVA3000/5000 GL 4.x active/active storage systems
  - Windows XP Professional multipath

Apple Mac OS X iSCSI Initiator rules and guidelines

Firmware and hardware required:

- Power PC and Intel Power Mac G5, Xserve, Mac Pro
- ATTO Mac driver version 3.10 (minimum)

Supports

- ISNS
- CHAP

Does not support:

- Multipathing

iSCSI Initiator operating system considerations

- Configure the Mac host mode iSCSI Initiator setting through HP Command View. See "HP StorageWorks mpx manager for Windows" on page 60 for more information on HP StorageWorks mpx Manager.
- Host mode setting is Apple Mac OS X.

Linux iSCSI Initiator rules and guidelines

Supports:

- Fibre Channel LUNs and iSCSI LUNs are not supported on the same server.

Does not support:

- NIC bonding

iSCSI Initiator operating system considerations:

- Configure the Linux host mode iSCSI Initiator setting through the mpx Manager GUI, CLI or through HP Command View. See "HP StorageWorks mpx manager for Windows" on page 60 for more information.

Solaris iSCSI Initiator rules and guidelines

Configure the host mode iSCSI Initiator setting through the mpx Manager GUI, CLI or through HP Command View. See HP StorageWorks mpx manager for Windows, page 60 for more information.

Operating system considerations:

- For HP Command View 8.0x and later, Solaris iSCSI initiators should be set to Solaris host mode.

Supports:

- Multipath
- Any native Solaris 1 GbE NIC

Does not support:

- TOE or iSCSI HBA

Solaris iSCSI Initiator multipath rules and guidelines

Supports:

- Solaris MPxIO only.

- Multipath on single or dual mpx100's/100b's.
- MPxIO Symmetric option only.
- MPxIO round-robin.
- MPxIO auto-failback.

Does not support:

- LUN 0
- SecurePath

OpenVMS iSCSI Initiator rules and guidelines

The following lists OpenVMS iSCSI Initiator rules and guidelines:

OpenVMS hardware requirements

The OpenVMS iSCSI Initiator has the following hardware requirements:

- Architecture
  - The software supplied in the iSCSI Initiator Technology Demonstration Kit (TDK) is supported on both Alpha and I64 architectures.
- iSCSI Targets
  - The only supported iSCSI targets are the HP StorageWorks EVA iSCSI connectivity option (mpx100). The mpx100 provides iSCSI access to EVA-based storage.
  - No other iSCSI storage targets are currently supported.
- NICs

  The platform on which the initiator is installed must contain at least one supported GbE NIC.
- Network Switches

  For best performance, the network switches to which the iSCSI-related NICs are connected should support:
  - The maximum link speed of the NICs
  - Jumbo frames
  - VLANs

OpenVMS software requirements

The OpenVMS iSCSI Initiator has the following software requirements:

- OpenVMS version—The OpenVMS Software-Based iSCSI Initiator TDK is available on OpenVMS V8.3-1H1 and later. Since OpenVMS V8.3-1H1 is an I64-only release, Alpha support will be made available with the next Alpha release.
- TCP/IP—The OpenVMS Software-Based iSCSI Initiator utilizes HP TCP/IP Services for OpenVMS. Third-party TCP/IP products are not supported and will not work with the initiator.

OpenVMS iSCSI rules and guidelines

Operating system considerations:

- EVA3000/5000 active/active support only
- EVA4000/4100/4400/4400 with embedded switch/6x00/8x00 supported (mpx100 only)

Supported:

- iSNS
- Multipath
- OpenVMS V8.3-1H1 or later

Not supported:

- CHAP
- Header and Data Digests
- iSCSI boot

iSCSI Initiator software

The EVA iSCSI option supports the OpenVMS native iSCSI software Initiator. See OpenVMS software requirements, page 36 for information on version support.

EVA storage system rules and guidelines

Table 7 identifies the EVA storage system rules and guidelines.

Table 7 EVA configuration table (mpx100/100b)

EVA storage system	Operating system	Software version	One mpx100	Second mpx100[1]	Fabric attach mpx100	Direct connect mpx100
EVA4x00/ 6x00/8x00	Microsoft Windows	For the latest information on operating system version support, see the product release notes or SPOCK at http://www.hp.com/storage/spock. You must sign up for an HP Passport to enable access.	√	√	√	√
	Apple Mac OS X		√	Not supported	√	√
	HP OpenVMS		√	Not supported	√	√
EVA3000/ 5000	Microsoft Windows		√	√	√	Not supported
	Apple Mac OS X		√	Not supported	√	
	OpenVMS		√	√	√	Not supported
EVA4x00/ 6x00/8x00	Sun Solaris		√	√	√	√
	VMware ESX		√	√	√	√

[1]For configurations that include both single-path and multipath operating systems, single-path operating systems are supported for single-path attachment on either (but not both) multipath mpx100s.

An EVA storage system configuration is considered to have two redundant HSV controllers. The following list details the limitations of an EVA storage system by failover mode configuration:

- In a fabric connect configuration, a maximum of two mpx100's/100b's can be zoned with one EVA storage system.
- In a fabric connect configuration, a maximum of one EVA storage system can be zoned with a maximum of two mpx100's/100b's.
- In a direct connect configuration, a maximum of two mpx100's/100b's are supported to one EVA storage system.

- An EVA storage system can present LUNs to iSCSI Initiators and Fibre Channel hosts concurrently.

HP StorageWorks EVA storage system software

An EVA LUN that has been presented to an iSCSI initiator is supported with EVA storage applications such as HP StorageWorks Continuous Access, Business Copy, SSSU, and Replication Solutions Manager. There are some restrictions with iSCSI hosts when using the EVA iSCSI connectivity option, as described in the following sections.

Supported features for iSCSI hosts

For HP StorageWorks Business Copy, iSCSI hosts are supported with the following basic Business Copy features:

- Snapshots of LUNs presented to iSCSI hosts
- Snapclones (normal or 3-phase) of LUNs presented to iSCSI hosts
- Instant Restore from snapclone to original source
- iSCSI hosts can access and write to EVA snapshots
- iSCSI hosts can access and write to EVA snapclones
- HP Command View, SSSU, or RSM can be used to create snapshots manually or automatically on a schedule using RSM
- CLI support to enter replication commands from iSCSI hosts

Features not supported for iSCSI hosts

Advanced replication features for LUNs presented to iSCSI hosts through the mpx100 that require a host agent on the iSCSI Initiator are not supported, as there are currently no iSCSI replication host agents available. The following features are not supported:

- Mounting and unmounting LUNs via a host agent. Mounting and unmounting LUNs must be done manually
- Accessing the host's view of the storage, such as viewing an `F drive` drive from a host
- Deploying host agents to allow customers to launch a script on the iSCSI host

Table 8 lists the support available for EVA storage system software when using the EVA iSCSI connectivity option.

Table 8 Support for EVA storage system software with iSCSI connectivity

HP StorageWorks storage product	mpx100 direct connect or mpx100 fabric attach
HP StorageWorks Business Copy	iSCSI and Fibre Channel hosts supported with Business Copy
HP StorageWorks Replication Solutions Manager, SSSU	iSCSI and Fibre Channel hosts supported
HP StorageWorks Continuous Access EVA	iSCSI and Fibre Channel hosts LUN remote replication supported
HP StorageWorks Continuous Access EVA with HP supported FCIP gateways	iSCSI and Fibre Channel hosts LUN remote replication supported

Fibre Channel switch/fabric rules and guidelines

In fabric-attachment mode, the mpx100/100b is supported with Fibre Channel switches (Table 9). For minimum switch firmware version, contact you HP representative.

Table 9 Fibre Channel switch/fabric requirements

Switch series	Model/Firmware level
B-series	For the latest information on operating system version support, see the product release notes or SPOCK at http://www.hp.com/storage/spock. You must sign up for an HP Passport to enable access.
C-series	
M-series	

HP Command View EVA management rules and guidelines

The following rules and guidelines for HP Command View EVA are applicable when using the EVA and EVA4400 iSCSI connectivity option:

- Supports HP Command View EVA iSCSI connectivity (Fibre Channel switch not required). See Figure 3, Figure 4, and the HP StorageWorks Command View EVA iSCSI deployment whitepaper at: http://h71028.www7.hp.com/ERC/downloads/4AA2-0607ENA.pdf.
- A maximum of two mpx100's/100b's can be discovered by an EVA storage system.
- Supports HP Command View 9.1 and 9.0.
- HP Command View EVA 8.0 or later is required for the EVA4400.
- HP Command View EVA 8.0.1 or later is required for the EVA4400 with embedded switch.
- HP Command View EVA manages the mpx100/100b out of band (IP) through the mpx100/100b Mgmt IP port. The HP Command View EVA application server must be on the same IP network with the mpx100/100b Mgmt IP port.

NOTE:

Communication between HP Command View EVA and the mpx100/100b is not secured by the communication protocol. If unsecured communication is a concern, HP recommends using a confined or secured IP network within a data center.

- The HP StorageWorks mpx100/100b iSCSI Initiator or iSCSI LUN masking information does not reside in the HP Command View EVA database. All iSCSI Initiator and LUN presentation information resides in the mpx100.
- The default iSCSI Initiator EVA host mode setting is Windows. The iSCSI Initiator for Linux, MAC, Solaris and VMware host mode setting may be configured with HP Command View.

Supported IP network adapters

Table 10 lists the IP network adapters supported by EVA iSCSI connectivity.

Table 10 Supported IP network adapters

Operating system	Supported IP network adapters

HP OpenVMS	All standard GbE NICs/ASICs supported by HP for OpenVMS
Apple Mac OS X	All standard GbE NICs/ASICs supported by Apple
Linux	All standard GbE NICs/ASICs supported by HP for Linux[1]: • HP NC3xx • HP NC510x (Red Hat 4, SUSE 9 only), TOE NIC features are not supported • QLA4052C/QLE4062C/QMH4062C
Microsoft Windows 2008, 2008 Server Core, 2003, and Windows XP	• All standard GbE NICs/ASICs supported by HP for Windows 2008, 2003 and Windows XP: • HP NC3xx TOE with MS scalable networking pack • QLA4052C/QLE4062C/QMH4062C • For Windows 2003 only: HP NC510x
Sun Solaris	• All standard GbE ICs/ASICs supported by Sun/HP for Sun • HP NC3xx
VMware	All standard GbE NICs/ASICs supported by HP for VMware EVA iSCSI connectivity: QLE4060C/QLE4062C/QMH4062

[1]TOE NIC features are not supported

NOTE:

For more information on QLogic adapters, visit www.qlogic.com.

IP network requirements

HP recommends the following:

- Network protocol: TCP/IP IPv6, IPv4 Ethernet 1000 Mb/s.
- IP data: LAN/VLAN support with less than 10 ms latency. Maximum of 1 VLAN per iSCSI port.
- A dedicated IP network for iSCSI data.
- IP management—LAN/WAN supported.

3 Installing and upgrading EVA iSCSI connectivity

This chapter contains information about the following topics:

- Verify your system requirements, page 41
- Verify your installation type and components, page 42
- EVA and EVA4400 iSCSI connectivity installation, page 43
- Rack mount the mpx100/100b, page 46
- Connect the mpx100/100b to an IP switch, page 47
- Start the mpx100/100b, page 48
- Set the mpx100/100b management port to use HP StorageWorks Command View EVA, page 48

To install your EVA iSCSI connectivity option, complete procedures in "Verify your system requirements" on page 41 through "Set the mpx100/100b management port to use HP StorageWorks Command View EVA" on page 48 in the order shown, depending upon your configuration.

Verifying your system requirements

Verify that your system has the hardware required for installing the HP StorageWorks EVA and EVA4400 iSCSI connectivity options:

- Server: Microsoft Windows Server 2008/2003, XP Professional, Apple Mac OS X, Linux Red Hat or SUSE, Sun Solaris, VMware, or HP OpenVMS (mpx100 only) server
- Storage system: EVA4000/4100/4400/4400 with embedded switch/6x00/8x00 or EVA3000/5000 storage system
- Connectivity: B-series, C-series, or M-series Fibre Channel switch for HP Command View EVA connectivity

NOTE:

For configurations that use *only* direct connect mpx100/100b and direct connect Windows hosts, HP supports HP Command View EVA connectivity without a Fibre Channel switch. See Figure 6 on page 25.

- Network and cables: A GbE IP Ethernet network and Cat 5e or Cat 6 network cables
- For the mpx100/100b-to-EVA fabric attach: a B-series, C-series, or M-series Fibre Channel switch, SFPs, and optical Fibre Channel cables

The supported operating systems are specified in Table 6 on page 32. See "Operating system rules and guidelines" on page 32 for detailed information about supported operating systems.

Verify your installation type and components

Table 11 describes the iSCSI installation types and attachment modes for the HP StorageWorks EVA and EVA4400 iSCSI connectivity option.

Table 11 Installation information

Installation type	Fibre Channel attachment mode
Factory installed with the Enterprise Virtual Array (EVA)	Direct connect (Figure 1 on page 23 and Figure 2 on page 23)
	Fabric (Figure 7 on page 26)
Field upgrade iSCSI option for an existing EVA	Direct connect (Figure 1 on page 23 and Figure 2 on page 23)
	Fabric (Figure 7 on page 26)
Field upgrade option for multipathing capability for an existing EVA with an iSCSI option[1]	Direct connect (Figure 8 on page 28)
	Fabric (Figure 9 on page 29)

[1]Adds a second mpx100

In addition to the configurations listed in Table 11, the EVA8x00 is supported with up to four iSCSI–Fibre Channel controller host ports, shown in Figure 6 on page 25 and Figure 10 on page 30

Table 12 lists installation components required for the iSCSI option.

Table 12 Installation components

Option	Installation components
HP StorageWorks EVA and EVA4400 iSCSI connectivity option—direct connect, factory installed	N/A
HP StorageWorks EVA and EVA4400 iSCSI connectivity option—fabric	Fibre Channel SFPs and optical cables. See the *HP StorageWorks EVA iSCSI Connectivity Option QuickSpecs* at: http://h18006.www1.hp.com/products/storageworks/evaiscsiconnect/index.html
HP StorageWorks EVA and EVA4400 iSCSI connectivity option (parts list)	1 mpx100 or mpx100b 1 EULA 1 Quick install instructions 1 ReadMeFirst 1 SR 232 port converter 1 Blank panel 1 B Bezel assembly, 1U 1 C-Shelf 1U 1 BKT slide 1U shelf, left 1 BKT slide 1U shelf, right 3 Nut U-Nut 10-32 0.615L x 0.520W CSZ 5 Screw, SEMS 10-32 Pan 0.625 XRCS 9 Screw, SEMS 10-32 Pan 0.325 XRCS 5 Nut, KEPs 10-32, 0.375AF CSZ EXT 2 Cable assembly, 4G copper, FC, SFP 2.0m* 1 PDU cord 2.4m (c13-c14) 2 EVA host port Fibre Channel loopback connectors

Option	Installation components
HP StorageWorks EVA and EVA4400 iSCSI Upgrade Option (parts list)	1 mpx100 or mpx100b 1 EULA 1 SR 232 port converter 1 Quick install instructions 1 ReadMeFirst

* 2.0m copper cables are for use in direct-connect configurations only. See Figure 1 through Figure 6 and Figure 8. Copper cables are not supported for fabric attach. Optical cables and SFPs can also be used for direct connect configurations.

Installing EVA and EVA4400 iSCSI connectivity

Select one of the following procedures, depending on your iSCSI option.

To install the HP StorageWorks EVA or EVA4400 iSCSI option, select the appropriate installation procedure:

- Fabric attach—Reconfigure the factory-installed EVA or EVA4400 iSCSI connectivity option to fabric attachment mode
- Field direct connect—HP StorageWorks EVA or EVA4400 iSCSI connectivity option with direct connect attachment mode
- Field direct connect—HP StorageWorks EVA or EVA4400 iSCSI connectivity option with direct connect attachment mode
- Multipath direct connect—HP StorageWorks EVA or EVA4400 iSCSI upgrade option for multipathing capability and direct connect attachment mode
- Multipath fabric attach—HP StorageWorks EVA or EVA4400 iSCSI upgrade option with multipathing capability and fabric attachment mode

Reconfiguring the factory-installed EVA or EVA4400 iSCSI connectivity option to fabric attach mode

Figure 1 on page 23 illustrates the factory-installed EVA iSCSI connectivity option and Figure 7 on page 26 illustrates the fabric iSCSI–Fibre Channel attachment mode configuration.

To install fabric attach:

1. Remove the two black Fibre Channel cables connecting the mpx100/100b to the HSV controllers.
2. Insert the SFPs into ports FC1 and FC2 on the mpx100/100b, and into an available FP port on each HSV controller. Then insert SFPs into four of the available ports on the Fibre Channel switches.
3. Connect one end of an orange Fibre Channel cable to the FC1 port on the mpx100/100b. Connect the other end of the cable to any available SFP port on the Fibre Channel switch.
4. Connect one end of an orange Fibre Channel cable to the FC2 port on the mpx100/100b. Connect the other end of the cable to any available SFP port on the Fibre Channel switch.
5. Connect one end of an orange Fibre Channel cable to any available port on the Fibre Channel switch. Connect the other end of the orange Fibre Channel cable to the available port on the top HSV controller.
6. Connect one end of an orange Fibre Channel cable to any available port on the Fibre Channel switch. Connect the other end of the cable to the available FP port on the bottom HSV controller.
7. Set the HSV controller ports to fabric topology.

NOTE:

For the EVA4400, see the product installation documentation.

a. Press the Down Arrow key on the EVA front panel. `System Information` is displayed.
b. Press the Right Arrow key. `Versions` is displayed.
c. Press the Down Arrow key. `Host Port Config` is displayed.
d. Press the Right Arrow key. `Fabric` is displayed.
e. Press **Enter**.
f. Press the Down Arrow key until the port that you want to change to Fabric Connect Mode is displayed.
g. Press **Enter**.
h. Repeat the process for the other controller and then reboot the storage system.

8. Continue with "Connect the mpx100/100b to an IP switch" on page 47.

Field direct connect—HP StorageWorks EVA or EVA4400 iSCSI connectivity option with direct connect attachment mode

Figure 1 on page 23 illustrates the direct connect iSCSI–Fibre Channel attachment mode configuration.

NOTE:

This option is supported only on the EVA4400 running XCS 09001000 or later firmware, or EVA4x00/6x00/8x00 running XCS 6.1x0 or later firmware.

To install field direct connect with direct connect attachment mode:

1. Rack mount the mpx100/100b. (See "Rack mount the mpx100/100b" on page 46.)
2. Connect one end of the black Fibre Channel cable into the FC1 port of the mpx100/100b (Figure 1 on page 23).
3. Connect the other end of the black Fibre Channel cable into an available FP port of the HSV top controller.
4. Connect one end of the black Fibre Channel cable into the FC2 port of the mpx100/100b (Figure 1 on page 23).
5. Connect the other end of the black Fibre Channel cable into an available FP port of the HSV bottom controller.
6. Install supplied port loopback connects on any unused HSV controller host ports.
7. Set the HSV controller ports to direct connect topology:

NOTE:

For the EVA4400, see the product installation documentation.

a. Press the Down Arrow key on the EVA front panel. `System Information` is displayed.
b. Press the Right Arrow key. `Versions` is displayed.
c. Press the Down Arrow key. `Host Port Config` is displayed.

d. Press the Right Arrow key. `Fabric` is displayed.
e. Press the Down Arrow key. `Direct Connect` is displayed.
f. Press the Right Arrow key. `Port 1` is displayed.
g. Press the Down Arrow key until the port that you want to change to `Direct Connect Mode` is displayed.
h. Press **Enter**.
i. Repeat the process for the other controller.

8. Continue with "Connect the mpx100/100b to an IP switch" on page 47.

Field fabric attach—HP StorageWorks EVA or EVA4400 iSCSI connectivity option with fabric attach mode

Figure 8 on page 28 illustrates the fabric iSCSI–Fibre Channel attachment mode configuration.

To install the iSCSI connectivity option with fabric attachment mode:

1. Rack mount the mpx100/100b. (See "Rack mount the mpx100/100b" on page 46.)
2. Install SFPs in the mpx100/100b ports (FC1, FC2) and the top and bottom controller FP ports.
3. Connect one end of the orange Fibre Channel cable to the FC1 SFP port of the mpx100/100b. Connect the other end of the orange Fibre Channel cable to any available SFP port on the Fibre Channel switch.
4. Connect one end of the orange Fibre Channel cable to the FC2 SFP port of the mpx100/100b. Connect the other end of the orange Fibre Channel cable to any available SFP port on the Fibre Channel switch.
5. Connect one end of the orange Fibre Channel cable to any available SFP port on the Fibre Channel switch. Connect the other end of the orange Fibre Channel cable to an available FP port on the top HSV controller.
6. Connect one end of the orange Fibre Channel cable to any available SFP port on the Fibre Channel switch. Connect the other end of the orange Fibre Channel cable to an available FP port on the bottom HSV controller.
7. Continue with "Connect the mpx100/100b to an IP switch" on page 47.

Multipath direct connect—HP StorageWorks EVA or EVA4400 iSCSI upgrade option for multipathing capability and direct connect attachment mode

Figure 8 on page 28 illustrates the EVA iSCSI direct connect mode for multipathing option.

To install the upgrade option with direct connect attachment mode:

1. Insert the new mpx100/100b into the rack shelf next to the existing mpx100/100b.
2. Remove the black Fibre Channel cable from the existing mpx100 FC2 port and connect it to the new mpx100 FC1 port.
3. Continue with "Connect the mpx100/100b to an IP switch" on page 47.

Multipath fabric attach—HP StorageWorks EVA or EVA4400 iSCSI upgrade option with multipathing capability and fabric attach mode

Figure 9 on page 29 illustrates the EVA iSCSI fabric attach mode for multipathing option.

To install the upgrade option with multipath direct connect attachment mode:

1. Insert the new mpx100/100b into the rack shelf next to the existing mpx100/100b.

2. Remove the orange Fibre Channel cable from the existing mpx100/100b FC2 port and Fibre Channel switch port.
3. Connect one end of the cable into the new mpx100/100b FC1 port and the other end into the second Fibre Channel switch port.
4. Disconnect the orange Fibre Channel cable from the top controller FP1 at the Fibre Channel switch end and connect it to the second Fibre Channel switch port.
5. Disconnect the orange Fibre Channel cable from the bottom controller FP2 at the Fibre Channel switch end and connect it to the first Fibre Channel switch port.
6. Continue with "Connect the mpx100/100b to an IP switch" on page 47.

Rack mounting the mpx100/100b

⚠ WARNING!

Mount the mpx100/100b in the rack so that the weight is evenly distributed. An unevenly loaded rack can become unstable, possibly resulting in equipment damage or personal injury.

This product is supplied with a three-wire cable and plug for the user's safety. Use this power cable in a properly grounded outlet to avoid electrical shock. An electrical outlet that is not correctly wired could place hazardous voltage on metal parts of the switch chassis. It is the responsibility of the customer to ensure the outlet is correctly wired and grounded to prevent electrical shock.

If the chassis is installed in a closed or multi-rack assembly, the operating temperature of the rack environment may be greater than the ambient temperature. Be sure to install the chassis in an environment that is compatible with the maximum ambient rated temperature.

You will need one Phillips head screw driver. To rack mount the mpx100/100b:

NOTE:

The rear of the C-Shelf is the end without the knurled thumbscrews.

1. Assemble two slide brackets (right and left) on the back ends of the C-Shelf, using the four hole nut plates.
   a. Mount the C-Shelf with the open side up.
   b. Fit the slide bracket along the 1U side at the back of the C-Shelf with its screw hole tab pointing outboard and its lip supporting the C-Shelf. There is a right-hand slide bracket and a left-hand slide bracket.
   c. Place the nut plate outside the right-hand slide bracket with the dimpled threaded holes pointing outboard.
   d. Place two screws (10-32 Pan 0.625 XRCS) through the two holes at the back of the C-Shelf, through the slide plate slots, and loosely into the front two threaded holes of the nut plate.
   e. Repeat with the opposite hand slide bracket.
2. Install the C-Shelf assembly into the rack.
   a. Locate a clear 1U area space within the rack.

NOTE:

The 1U space in a rack includes three rail mounting holes; these rack holes, however, are not evenly spaced. For best installation the C-Shelf can be centered in a 1U space. Locate the center, find a hole that is 5/8" on center from the holes immediately above and below. This is the center of a 1U mounting position. The holes, two above and two below this center, are only 1/2" on center from their adjacent holes.

b. At the front of the rack, in the center mounting holes, install the KEPs 10–32 and 0.375 AF–CSZ EXT nuts.
c. Carefully supporting the C-Shelf assembly, loosely thread the knurled thumbscrews through the rack into the two nuts just installed.
d. Go to the back of the rack and position a slide bracket next to the corresponding holes at the back of the rack. Slide the bracket to the rear until the threaded screw hole tabs are flush with the inside of the rack rail.
e. Insert two 10-32 Pan 0.325 XRCS screws through the rack rail into the threaded screw hole tab and tighten loosely.
f. Repeat step e on the other side of the C-Shelf assembly.
g. Tighten all four 10-32 Pan 0.325 XRCS screws at the rear of the C-Shelf assembly.
h. Tighten the front two knurled thumbscrews.
i. Tighten the two 10-32 Pan 0.625 XRCS screws at each side of the back of the C-Shelf assembly.

3. Install the mpx100/100b into one of the two available positions in the C-Shelf:
   a. Slide the mpx100/100b in (from the front of the equipment rack).
   b. Make sure that the four tabs (two at the front and two at the rear) catch, to ensure that the mpx100.100b is firmly seated in the C-Shelf assembly. To ensure that all four tabs engage, hold both the C-Shelf assembly and the mpx100/100b as you slide it in the last inch.
   c. Once the rear of the mpx100/100b is flush with the front of the C-Shelf assembly and all four clips are engaged, snap the Bezel on the front.

Connecting the mpx100/100b to an IP switch

To connect the mpx100/100b to an IP switch:

1. Connect one end of a standard Cat 5e or Cat 6 network cable to the IP network management port on the mpx100/100b (Figure 1 on page 23). Connect the other end to an IP switch in a network that is accessible from the management server running HP Command View EVA.
2. Connect one end of another Cat 5e or Cat 6 network cable to the GE1 port on the mpx100/100b. Connect the other end to an IP switch in the IP network that is accessible from the servers running an iSCSI Initiator.
3. Continue with "Start the mpx100/100b" on page 48.

NOTE:

The management and GE port cables can be connected to the same IP network provided the subnet settings are configured to allow both Management and iSCSI communications.

Starting the mpx100/100b

To start the mpx100/100b:

1. Attach the AC power cord to the mpx100/100b and the power distribution unit (PDU). Verify that the mpx100's/100b's System Power LED is illuminated.

   The mpx100/100b runs a self-test and begins normal operation.

2. Verify that the Heartbeat LED is blinking (once per second) and that the Input Fault LED is not illuminated. Figure 11 shows the location of the ports and LEDs on the mpx100/100b.

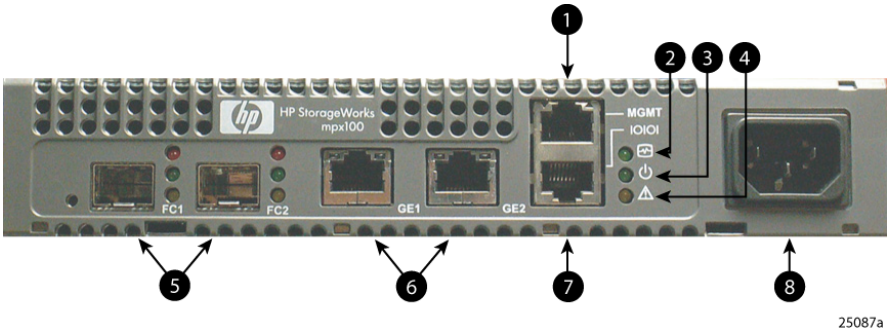


Figure 11 The mpx100 port and LED locations

1. Management port (10/100 Ethernet)
2. Heartbeat LED
3. Input Power LED
4. System Fault LED
5. FC ports
6. iSCSI ports
7. RS–232 port
8. AC power

Setting the mpx100/100b management port to use HP StorageWorks Command View EVA

Communication between the mpx100/100b and HP Command View EVA is established through the IP management port of the mpx100/100b and the IP connection of the HP Command View EVA application server. This link is necessary for iSCSI device discovery and subsequent iSCSI settings of the mpx100/100b through HP Command View EVA.

To set the mpx100/100b management port:

1. Use Telnet to connect to the mpx100/100b management port, or connect to the mpx100/100b serial port using the HP-supplied connector.

NOTE:

The mpx100/100b management port's default IP address is `10.0.0.1/255.0.0.0`. The mpx100/100b serial port's default setting is `115200/8/n/1`.

2. Log in with the user name `guest` and the password `password`.

3. Enter the command `admin start` with the password `config` to enable administrator privileges.
4. Enter the `set mgmt` command and follow the prompts to set the management port properties to enable HP Command View EVA to communicate with the mpx100/100b management port.

NOTE:

Changes to the management port using the `set mgmt` command are effective immediately. Communications may be lost if Telnet was used to log in to the mpx100/100b.

5. Start HP Command View EVA and select the iSCSI Devices folder under the Hardware folder in the HP StorageWorks Command View EVA window.
6. Click **Discover iSCSI Devices** (Figure 12). If the iSCSI device is not discovered, click **Add iSCSI Device**, enter the mpx100/100b IP address, and then click **OK**.

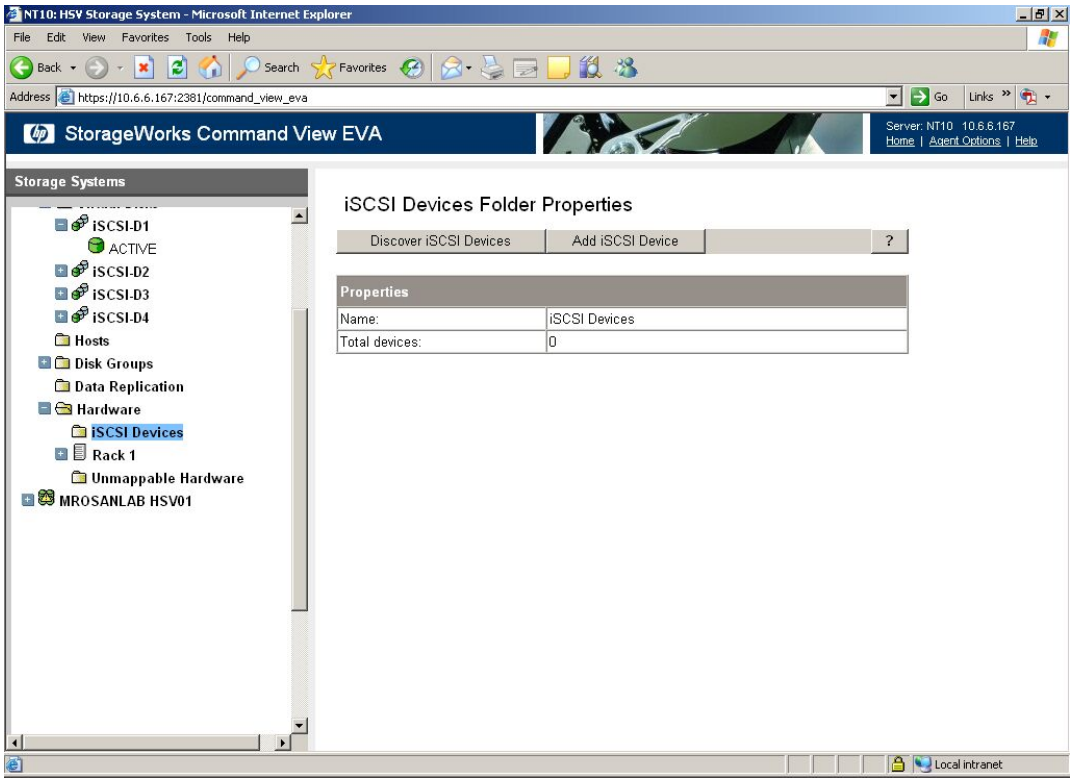


Figure 12 Discover iSCSI devices

7. Click **iSCSI Controller 1** under **Hardware/iSCSI Devices** (Figure 13).

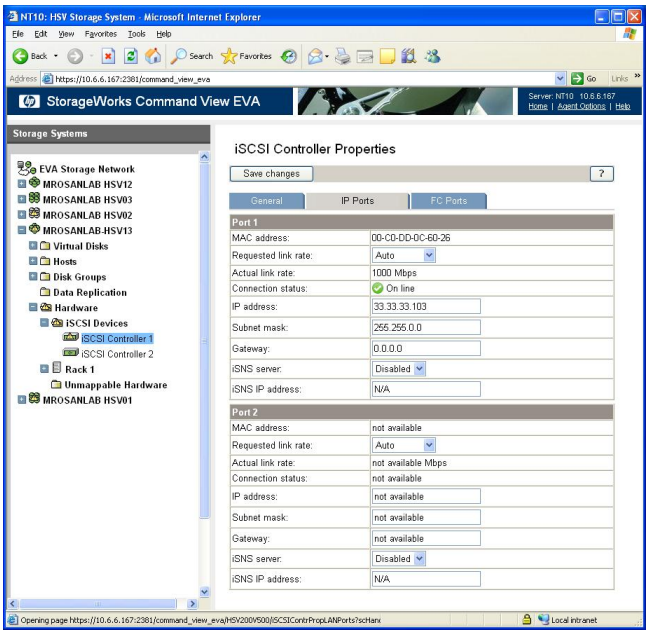


Figure 13 Hardware/iSCSI devices

8. Enter the IP address and subnet mask for Port 1 on the IP Ports tab, and then click **Save changes**.

4 Configuring the mpx100/100b

This chapter contains the following major sections:

- General description, page 51
- Installation and maintenance, page 57

General description of the mpx100/100b

The mpx100/100b

The mpx100 serves as the data transport between iSCSI hosts and the EVA storage system (see Figure 14). The mpx100/100b connects to iSCSI hosts through IP connections, and to an EVA storage system directly through FC ports or FC switch ports.

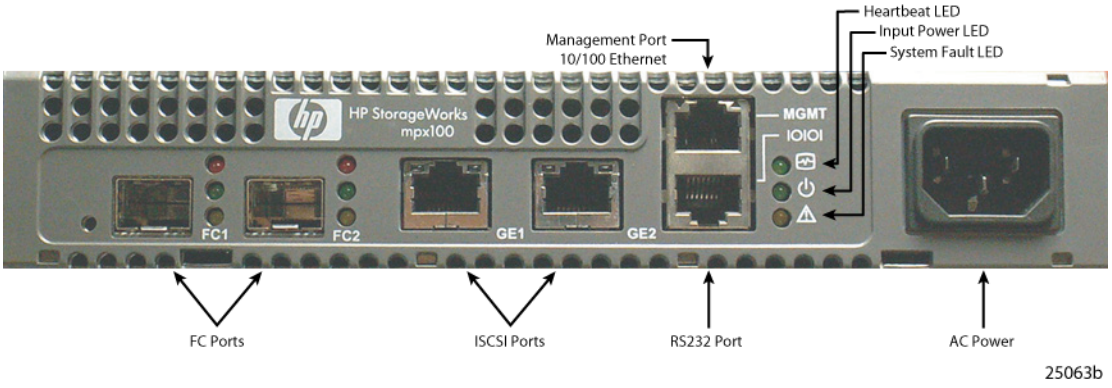


Figure 14 The mpx100 external components

Chassis LEDs

The chassis LEDs shown in Figure 15 provide information about the mpx100's/100b's operational status. These LEDs include the Input Power LED, Heartbeat LED, and the System Fault LED. To apply power to the mpx100/100b, plug the power cord into the mpx100/100b AC power receptacle and into a 100-240 VAC power source.

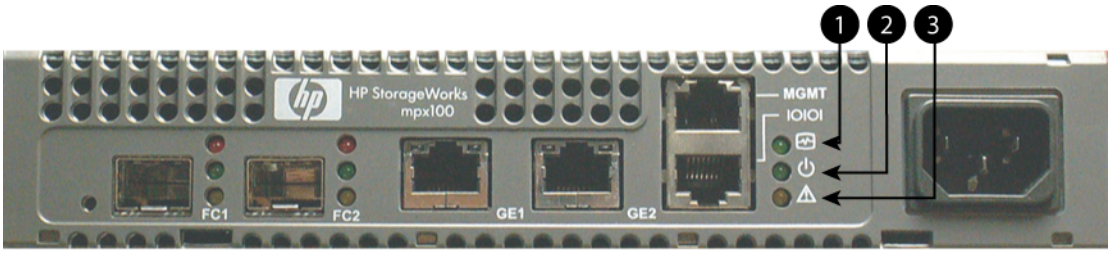


Figure 15 Chassis LEDs

1. Heartbeat LED
2. Input Power LED
3. System Fault LED

Power LED (green)

The Power LED indicates the input voltage status at the mpx100/100b logic circuit board. During normal operation, this LED is illuminated to indicate that the mpx100/100b logic circuit board is receiving the DC voltage from the power supply.

Heartbeat LED (green)

The Heartbeat LED indicates the status of the internal mpx100/100b processor and any power-on self test (POST) error results. Following a normal power-up, the Heartbeat LED blinks about once per second to indicate that the mpx100/100b passed the POST and that the internal mpx100/100b processor is running. See "Heartbeat LED blink patterns" on page 174 for a description of all Heartbeat LED blink codes.

System Fault LED (amber)

The System Fault LED illuminates to indicate that a fault exists in the mpx100/100b firmware or hardware. Fault conditions include POST errors and over-temperature conditions. The Heartbeat LED shows a blink code for POST errors, IP address conflicts, and the over-temperature condition. See "Heartbeat LED blink patterns" on page 174 for more information.

Chassis controls

The Maintenance button shown in Figure 16 is the only chassis control; it is used to reset the mpx100/100b or to recover a disabled mpx100/100b.

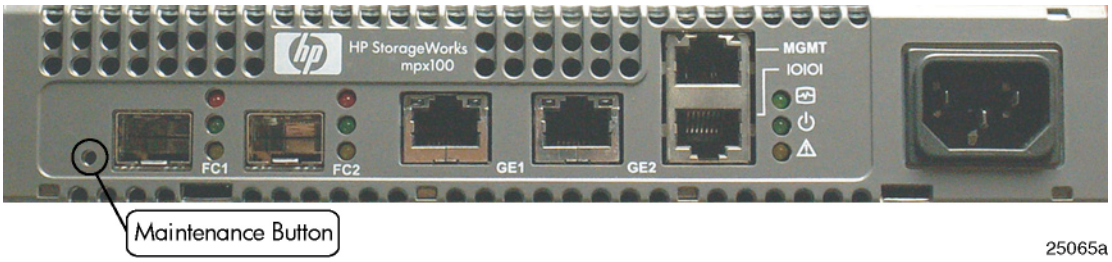


Figure 16 Chassis controls

Maintenance button

The Maintenance button is a multifunction momentary switch on the front panel. It provides the following functions:

- Reset
- Select boot image
- Reset IP address
- Enable DHCP
- Factory defaults

Resetting the mpx100/100b

To reset the mpx100/100b, use a pointed nonmetallic tool to briefly press and release (less than two seconds) the **Maintenance** button. The mpx100/100b responds as follows:

1. All the chassis LEDs are illuminated.
2. After approximately two seconds, the power-on self-test (POST) begins, extinguishing the Heartbeat and System Fault LEDs.
3. When the POST is complete, the Power LED illuminates and the Heartbeat LED flashes once per second.

Resetting the IP address

To reset the mpx100/100b and restore the maintenance port IP address to the default of 10.0.0.1, briefly press the Maintenance button with a pointed non-metallic tool, releasing the button after six seconds (six flashes of the Heartbeat LED). The mpx100/100b boots and sets the maintenance port to IP address 10.0.0.1. The boot time is less than one minute.

NOTE:

Setting the IP address by this method is not persistent; to make the change persistent, use the command line interface (CLI) or GUI.

Enabling DHCP

Reset the mpx100/100b and configure the maintenance port to use DHCP to access its IP address. However, enabling DHCP by this method is not persistent. To make the change persistent, use the CLI or GUI.

Use a pointed nonmetallic tool to briefly press the Maintenance button. Release the button after seven seconds (observe seven flashes of the Heartbeat LED). The mpx100/100b boots and configures the maintenance port for DHCP. The boot time is less than one minute.

Resetting to factory default configuration

To reset the mpx100/100b and restore it to the factory default configuration (that is, to reset passwords, maintenance port IP address 10.0.0.1, iSCSI ports disabled with no IP address, erase presentations, erase discovered initiators and targets), use a pointed nonmetallic tool to briefly press the Maintenance button. Release the button after twenty seconds (observe twenty flashes of the Heartbeat LED). The mpx100/100b boots and is restored to factory defaults. The boot time is less than one minute.

FC ports

The mpx100/100b has two Fibre Channel 1 Gb/s/2 Gb/s ports. The ports are labeled **FC1** and **FC2**, as shown in Figure 17. Each of the ports is served by an SFP optical transceiver and is capable of 1 Gb/s or 2 Gb/s transmission. The SFPs are hot-pluggable. User ports can self-discover both the port type and transmission speed when connected to devices or switches. The port LEDs, located to the right of their respective ports, provide status and activity information.

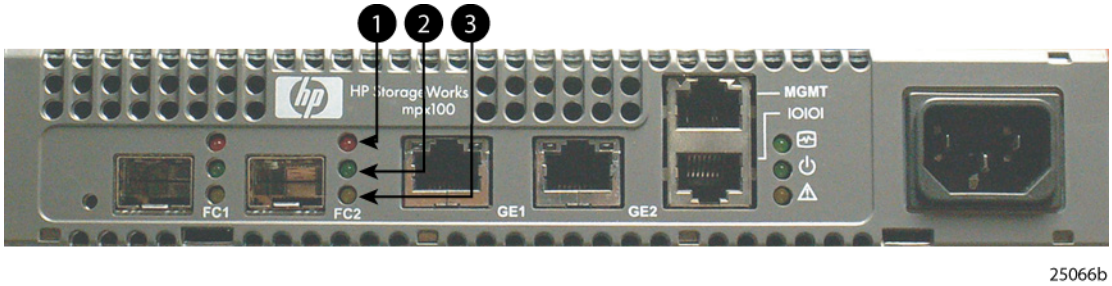


Figure 17 Fibre Channel LEDs

1. Activity LED
2. Status LED
3. Alert LED

Port LEDs

Each port has three LEDs: amber LED (top) indicates activity, green LED (middle) indicates status, yellow LED (bottom) indicates an alert condition. Table 13 specifies the colored LEDs associated with port activity.

Activity LED (amber)

The Activity LED indicates that data is passing through the port.

Status LED (green)

The Status LED indicates the logged-in or initialization status of the connected devices. The Status LED flashes to indicate the link rate: once for 1 Gb/s and twice for 2 Gb/s.

Alert LED (yellow)

The Alert LED indicates any port fault conditions.

Table 13 Port LED messages

Activity	Amber LED	Green LED	Yellow LED
Power off	OFF	OFF	OFF
Power on (before F/W Initialization)	ON	ON	ON
On-Line link established at 1-Gbps	OFF	3 seconds on—Flash off once	OFF
Activity at 1-Gbps	ON	3 seconds on—Flash off once	OFF
On-Line Link established at 2-Gbps	OFF	3 seconds on—Flash off twice	OFF
Activity at 2-Gbps	ON	3 seconds on—Flash off twice	OFF
Power on (after FW initialization and/or loss of synchronization)	OFF	ON	ON
Firmware error	Error code	Error code	ON
Beacon	Flash	Flash	Flash

Transceivers

The mpx100/100b supports SFP optical transceivers for the FC ports. A transceiver converts electrical signals to and from optical laser signals to transmit and receive data. Duplex fiber optic cables plug into the transceivers, which then connect to the devices. A 1 Gb/s/–2 Gb/s FC port is capable of transmitting at 1 Gb/s or 2 Gb/s; however, the transceiver must also be capable of delivering these rates.

The SFP transceivers are hot-pluggable. This means you can remove or install a transceiver while the mpx100/100b is operating without harming the mpx100/100b or the transceiver. However, communication with the connected device will be interrupted.

iSCSI/Gigabit Ethernet ports

The iSCSI/Gigabit Ethernet ports shown in Figure 18 are RJ-45 connectors that provide connection to an Ethernet network through a 10/100/1000 Base-T Ethernet cable. The ports are labeled **GE1** and **GE2**.

These ports have two LEDs: the Link Status LED (green) and the Activity LED (green). The Link Status LED illuminates continuously when an Ethernet connection has been established. The Activity LED illuminates when data is being transmitted or received over the connection.

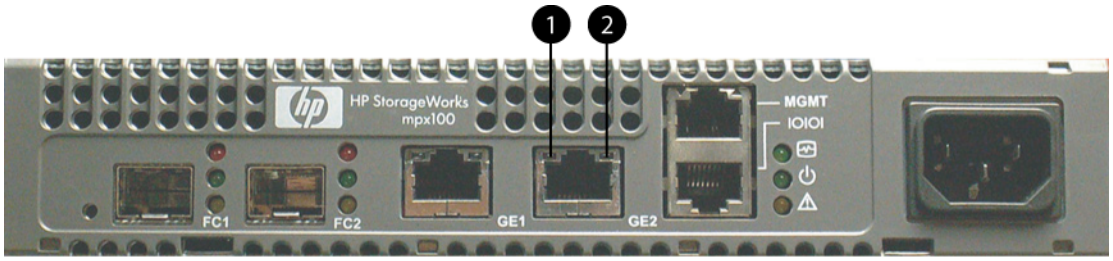


Figure 18 Gigabit Ethernet (iSCSI) ports

1. Activity LED
2. Status LED

Port LEDs

The iSCSI/TOE ports each have two LEDs: the Link Status LED (green) and the Activity LED (green).

Activity LED (green)

The Activity LED illuminates when data is being transmitted or received over the Ethernet connection.

Link Status LED (green)

The Link Status LED illuminates continuously when an Ethernet connection has been established.

Management Ethernet port

The management Ethernet port shown in Figure 19 is an RJ-45 connector. It provides a connection to a management server through a 10/100 Base-T Ethernet cable. The port is labeled **MGMT**.

The management server is a Windows server that is used to configure and manage the mpx100/100b. You can manage the mpx100/100b over an Ethernet connection using the mpx Manager or the CLI.

The management Ethernet port has two LEDs: the Link Status LED (green) and the Activity LED (green). The Link Status LED illuminates continuously when an Ethernet connection is established. The Activity LED illuminates when data is transmitted or received over the Ethernet connection.

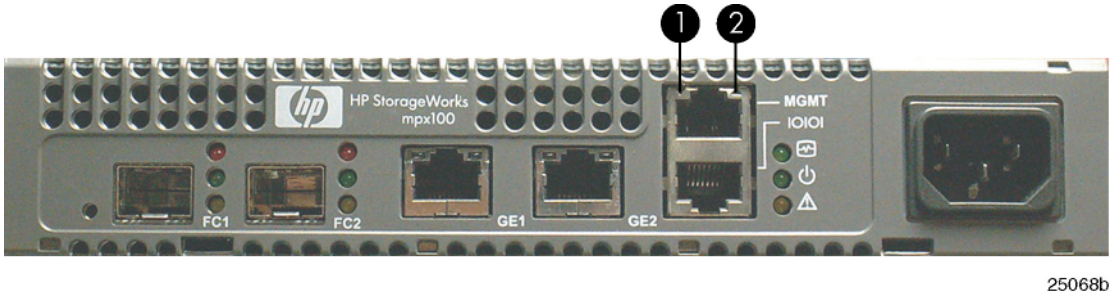


Figure 19 Management Ethernet port

1. Status LED

2. Activity LED

Serial port

The mpx100/100b is equipped with an RS-232 serial port for maintenance purposes. The serial port location is shown in Figure 20, and is labeled **IOIOI**. You can manage the mpx100/100b through the serial port using the CLI.

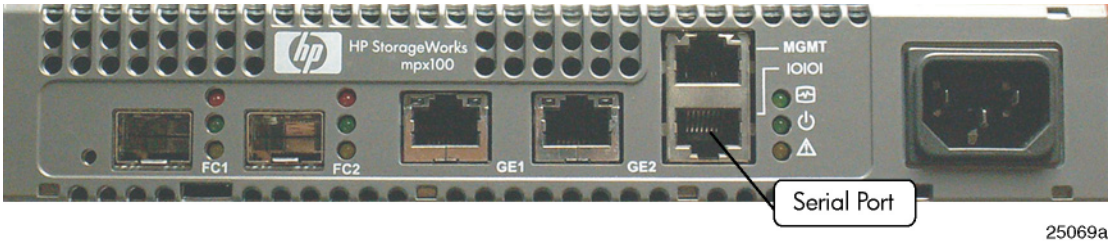


Figure 20 Serial port

The serial port is connected using a standard 8-wire Ethernet cable and the supplied dongle to convert the Ethernet RJ–45 connector to a female DB9 connector. Refer to Table 14 for definitions of the serial port pins for both the mpx100's/100b's RJ–45 connector and the dongle DB9 connector.

Table 14 Serial port pin definition

Dongle DB9 pin number	mpx100/100b RJ–45 pin number	Description
1	5	Data carrier detect (DCD)
2	6	Receive data (RxD)
3	3	Transmit data (TxD)
4	2 & 7	Data terminal ready (DTR)
5	4	Signal ground (GND)
6	5	Data set ready (DSR)
7	1	Request to send (RTS)
8	8	Clear to send (CTS)
9	N/C	Ring indicator (RI)

Installation and maintenance

This section describes how to install and configure the mpx100/100b. It also describes how to update new firmware and recover a disabled mpx100/100b.

For the mpx100/100b hardware installation, see “Installing and upgrading EVA iSCSI connectivity” on page 41.

Power requirements

Power requirements for the mpx100/100b are 0.5 Amp at 100 VAC or 0.25 A at 240 VAC.

Environmental conditions

Consider the factors that affect the climate in your facility, such as equipment heat dissipation and ventilation. The mpx100/100b requires the following operating conditions:

- Operating temperature range: 5°–40° C (41°–104° F)
- Relative humidity: 15–80%, noncondensing

Connecting the server to the mpx100/100b

You can manage the mpx100/100b using the HP StorageWorks mpx Manager or the CLI. HP StorageWorks mpx Manager requires an Ethernet connection to the mpx100/100b management port. The CLI uses either an Ethernet connection or a serial connection. Choose the mpx100/100b management method, then connect the management server to the mpx100/100b in one of the following ways:

- Indirect Ethernet connection from the management server to the mpx100/100b RJ-45 connector through an Ethernet switch or hub.
- Direct Ethernet connection from the management server to the mpx100/100b RJ-45 Ethernet connector.
- Serial port connection from management workstation to the mpx100/100b RS-232 serial port connector. This requires a 10/100 Base-T straight cable and a dongle.

Configuring the server

If you plan to use the CLI to configure and manage the mpx100/100b, you must configure the server appropriately. This involves either setting the server IP address for Ethernet connections, or configuring the server's serial port.

If you plan to use HP StorageWorks mpx Manager to manage the mpx100/100b, see "Install the management application" on page 59.

Setting the server IP address

The IP address of a new mpx100/100b is 10.0.0.1\255.0.0.0. To ensure that your server is configured to communicate with the 10.0.0 subnet, see the following instructions for your server.

To set the server address for a Windows server:

1. Select **Start > Settings > Control Panel > Network and Dial-up Connections**.
2. Select **Make New Connection**.
3. Click **Connect to a private network through the Internet**, and then click **Next**.
4. Enter `10.0.0.253` for the IP address.

Configuring the server serial port

To configure the server serial port:

1. Connect the cable with the supplied dongle from a COM port on the management server to the serial port on the mpx100/100b.
2. Configure the server serial port according to your operating system.

   For Windows:

   a. Open the HyperTerminal application.

   b. Select **Start > Programs > Accessories > HyperTerminal > HyperTerminal**.

   c. Enter a name for the mpx100/100b connection and choose an icon in the Connection Description window, and then click **OK**.

   d. Enter the following COM Port settings in the COM Properties window, and then click **OK**.

      - Bits per second: 115200
      - Data Bits: 8
      - Parity: None
      - Stop Bits: 1
      - Flow Control: None

      For Linux:

      i. Set up minicom to use the serial port. Create or modify the `/etc/minirs.dfl` file with the following content:

         ```
         pr portdev/ttyS0

         pu minit

         pu mreset

         pu mhangup
         ```

         The command line `pr portdev/ttyS0` specifies port 0 on the server. Choose the `pr` setting to match the server port to which you connected the mpx100/100b.

      ii. To verify that all users have permission to run minicom, review the `/etc/minicom.users` file and confirm that the line *ALL* exists or that there are specific user entries.

3. Continue with "Connect the mpx100/100b to AC power" on page 61.

Installing the mpx Manager as a standalone application

You can manage the mpx100/100b using HP StorageWorks mpx Manager as a standalone application. The mpx Manager software is available in the *HP StorageWorks iSCSI Connectivity Option for Enterprise Virtual Arrays software kit*. The Linux kit is provided in `.tar.gz` format and the Windows kit is provided as a CD image (`.iso` file or `.zip` file). The kits are available at http://h18006.www1.hp.com/products/storageworks/evaiscsiconnect/index.html.

Table 15 lists the requirements for the management servers running HP StorageWorks mpx Manager.

NOTE:

For Windows, you can write the `.iso` file to a CD-ROM or copy the `.zip` file to a folder.

Table 15 mpx Manager GUI server requirements

Component	Requirement
Operating system	Windows: Guest OS: Windows 2003 Windows Server 2003 SP1, 2003 r2, 2003 SP2 Windows Server 2003 x64 Edition SP1, 2003 r2, 2003 SP2 Linux: (Itanium and X86/x64 systems) Red Hat: • Red Hat Advanced Server Linux 4, Update 3 (kernel 2.6.9-34 using the bundled iSCSI driver) X86 • Red Hat Enterprise Linux 3, Update 5 X86 • Red Hat Linux Enterprise Server 4 X86 • Red Hat Enterprise Linux 5 server X86 SUSE Linux: • SUSE Linux Enterprise Server 8, SP4 X86 • SUSE Linux Enterprise Server 9 SP3 (kernel 2.6.5-7.244 using the bundled iSCSI driver) X86 • SUSE Linux Enterprise Server 10 X86
Memory	256 MB or more
Disk space	150 MB per installation
Processor	500 MHz or faster
Hardware	CD-ROM drive, RJ-45 Ethernet port, RS-232 serial port (optional)
Internet browser	Microsoft Internet Explorer 5.0 and later Netscape Navigator 4.72 and later Mozilla 1.02 and later Safari Java 2 Runtime Environment to support web applet

HP StorageWorks mpx Manager for Windows

You can install HP StorageWorks mpx Manager on a Windows server. To install the HP StorageWorks mpx Manager application from the HP StorageWorks iSCSI connectivity option for Enterprise Virtual Arrays installation CD:

1. Close all programs currently running, and insert the CD into the management servers CD-ROM drive.
2. Click **Management Software** in the upper left corner of the product introduction screen to display the table. If the product introduction screen does not open, open the CD with Windows Explorer and run the installation program.
3. Locate your platform in the table and click **Install**.

HP StorageWorks mpx Manager for Linux

This section describes how to install HP StorageWorks mpx Manager on a Linux server.

NOTE:

In the following procedure, replace `n.n.nn` and `n.nnbnn` with file names (for example, 2.0.65 and 2.65b85).

1. Download the `hpmpx_n.n.nn_linux_install.tar.gz` file from http://h18006.www1.hp.com/products/storageworks/evaiscsiconnect/. The `.gz` file contains the `GUI.bin` file and a GUI install README file.
2. Unpack the file to a temporary directory. For example:

   ```
   tar -zxvf hpmpx_n.n.nn_linux_install.tar.gz
   ```

3. Issue the following command to start the install:

   ```
   ./hpmpxn.n.nnbnn_linux_install.bin.
   ```

   A `chmod` may be necessary prior to execution.
4. Follow the installation instructions on the screen and note the installation location. The default directory is `/opt/Hewlett-Packard/mpxManager`.

Connecting the mpx100/100b to AC power

To power up the mpx100/100b, connect the power cord to the power receptacle on the mpx100/100b chassis and to a grounded AC outlet. The mpx100/100b responds in the following sequence:

1. The chassis LEDs (Input Power, Heartbeat, System Fault) illuminate, followed by all port LEDs.
2. After a couple of seconds, the Heartbeat and System Fault LEDs are extinguished, while the Input Power LED remains illuminated. The mpx100/100b is executing the POST.
3. After approximately 45 seconds, the POST is complete and the Heartbeat LED starts flashing at a one-second rate. Any other blink pattern indicates an error has occurred. See the "Heartbeat LED blink patterns" on page 174 for more information about error blink patterns.

Starting and configuring the mpx100/100b

Starting HP StorageWorks mpx Manager for Windows

Select one of the following options to start HP StorageWorks mpx Manager for Windows:

For Windows:

1. Select **HP StorageWorks mpx Manager** from the Start menu.
2. Double-click the HP StorageWorks mpx Manager shortcut.
3. Click the **HP mpx Manager** icon.

   The Connect to the mpx100/100b window is displayed (Figure 21).
4. Enter the host name or IP address of the management port of the mpx100/100b.

NOTE:

Click **Connect** to add mpx100's/100b's to be managed simultaneously.

5. Click **Connect** to display the selected HP mpx Manager. A typical mpx Manager is displayed (Figure 22).

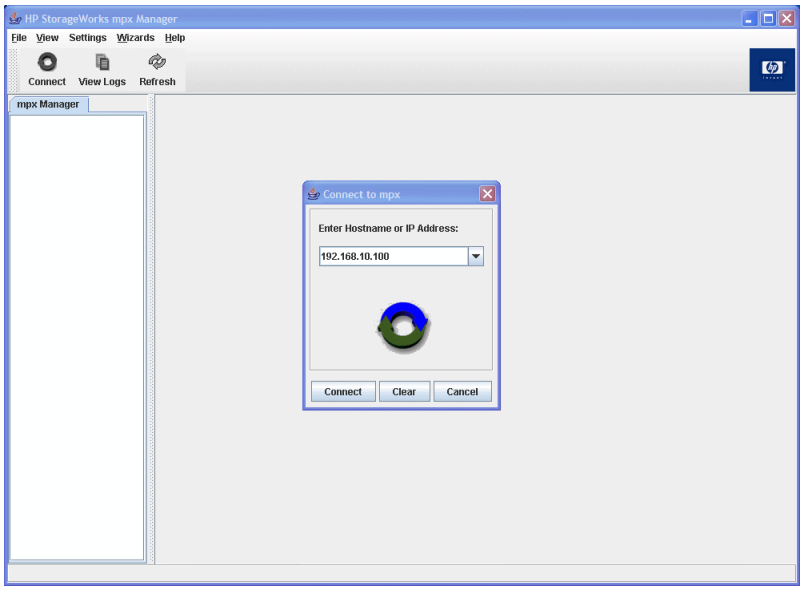


Figure 21 Connect to the mpx100/100b

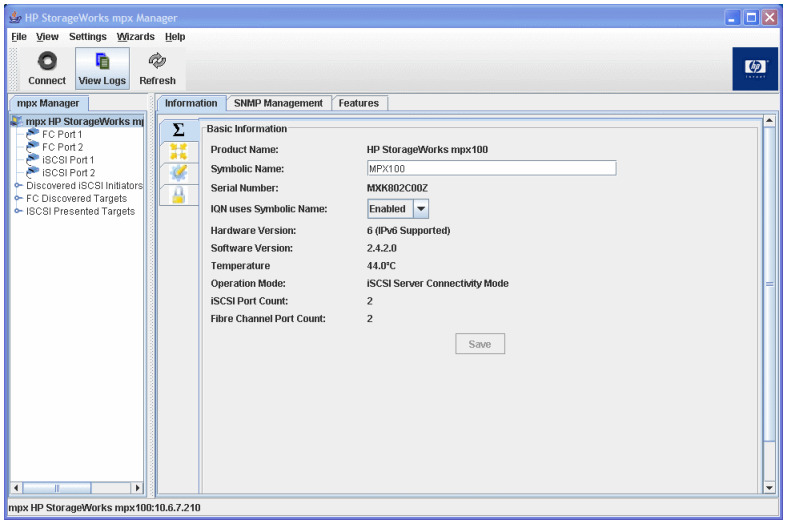


Figure 22 Typical mpx Manager display

Starting HP StorageWorks mpx Manager for Linux

To start HP StorageWorks mpx Manager for Linux:

1. Enter the mpx100/100b command: `<install_directory> ./HPmpx100Manager`. The Connect to the mpx100/100b window is displayed (Figure 21 on page 62).

2. Enter the host name or IP address of the management port of the mpx100/100b.
3. Click **Connect** to display the selected HP mpx Manager. A typical mpx Manager is displayed (Figure 22 on page 62).

Configuring the mpx100/100b

You can configure the mpx100/100b using the HP StorageWorks mpx Manager application or the CLI.

To configure the mpx100/100b using the CLI:

1. Open a command window according to the type of server and connection:
   - Ethernet (all platforms): Open a Telnet session with the default mpx100/100b IP address and log in to the mpx100/100b with the default account name and password (`guest/password`):

     ```
     telnet 10.0.0.1
     username: guest
     password: password
     ```

   - Serial—Windows: Open the HyperTerminal application on a Windows platform.
     - Select **Start > Programs > Accessories > HyperTerminal > HyperTerminal**.
     - Select the connection you created earlier and click **OK**.
   - Serial—Linux: Open a command window and enter the following command:

     ```
     minicom
     ```

2. Open an Admin session and enter the commands to set up both iSCSI ports and the management interface. See "Using the command line interface" on page 139 for command descriptions.

```
mpx100 #> admin start
Password: config
mpx100 (admin) #> set mgmt
.....
mpx100 (admin) #> set iscsi 1
.....
mpx100 (admin) #> set iscsi 2
.....
```

Configuring the mpx100/100b iSCSI ports for Internet Storage Name Service (iSNS) (optional)

The mpx100/100b iSCSI ports support Microsoft iSNS Server software. iSNS is a protocol designed to facilitate the automated discovery, management, and configuration of iSCSI devices on a TCP/IP network. For more information, see the Microsoft website:

http://www.microsoft.com/downloads/details.aspx?familyid=0DBC4AF5-9410-4080-A545-F90B45650E20&displaylang=en

You can configure each port to register as an iSCSI Target with an iSNS server using the HP StorageWorks mpx Manager GUI or the CLI.

To configure iSNS on an iSCSI port using the HP StorageWorks mpx Manager:

1. Double-click the desired mpx100/100b in the topology display.
2. Select the **Information** tab.

3. Enter a unique name in the **Symbolic Name** box.

NOTE:

The Symbolic Name syntax must follow the iSCSI standard for IQN naming.

Only the following ASCII characters (U+0000 to U+007F), are allowed:

- ASCII dash character (-) = U+002d
- ASCII dot character (.) = U+002e
- ASCII colon character (:) = U+003a
- ASCII lowercase characters (a through z) = U+0061 through U+007a
- ASCII digit characters (0 through 9) = U+0030 through U+0039

See section 3.2.6 of Request for Comments (RFC) 3720 (iSCSI) for a description of the iSCSI name string profile. You can access RFC 3720 at the FTP site: `ftp://ftp.rfc-editor.org/in-notes/rfc3720.txt`.

4. In the IQN uses Symbolic Name box, select **Enable**. When this setting is enabled, the mpx100/100b embeds the symbolic name as part of the Target IQN on the iSNS server. This also helps users to recognize the target if multiple mpx's are registered with the same iSNS server.
5. Select an iSCSI port under the mpx100/100b Manager tab.
6. Select the **Enable iSNS** check box, and then enter the IP address of the iSNS server.
7. Click **Save**.

To configure iSNS on an iSCSI port using the CLI:

1. Enter the `mpx100 (admin) #> set system` command:

```
mpx100 (admin) #> set system
A list of attributes with formatting and current values will follow.
Enter a new value or simply press the Enter key to accept the current
value. If you wish to terminate this process before reaching the end
of the list press 'q' or 'Q' and the Enter key to do so. WARNING:If
enabled by operator, the Symbolic Name can be embedded as part of
theiSCSI Name. Changes to the iSCSI name will be effective after a
reboot. Only valid iSCSI name characters will be accepted. Valid
characters include alphabetical (a-z, A-Z), numerical (0-9), colon,
hyphen, and period.

 System Symbolic Name (Max = 64 charac-
 ters)                                    [             ]

 Embed Symbolic Name (0=Enable,1=Disable) [Disabled     ]

 System Log Level (Min = 0, Max = 3)      [0            ]

All attribute values that have been changed will now be saved.
mpx100 (admin) #>
```

TIP:

You can exit the set system command window without making changes to the existing values by pressing **q** or **Q**, and then pressing **Enter**.

2. Enter a unique Symbolic Name or press **Enter** to accept the current value.

```
System Symbolic Name (Max = 64 charac-
ters)                                          [              ] MPX100-65

Embed Symbolic Name (0=Enable,1=Disable)       [Disabled      ]

System Log Level (Min = 0, Max = 3)            [0             ]
```

NOTE:

The Symbolic Name syntax must follow the iSCSI standard for IQN naming. Only the following ASCII characters (U+0000 to U+007F), are allowed:

- ASCII dash character (-) = U+002d
- ASCII dot character (.) = U+002e
- ASCII colon character (:) = U+003a
- ASCII lowercase characters (a through z) = U+0061 through U+007a
- ASCII digit characters (0 through 9) = U+0030 through U+0039

See section 3.2.6 of Request for Comments (RFC) 3720 (iSCSI) for a description of the iSCSI name string profile. You can access RFC 3720 at the FTP site: `ftp://ftp.rfc-editor.org/in-notes/rfc3720.txt`.

3. Enable the **Embed Symbolic Name** option.

   When this setting is enabled, the mpx100/100b embeds the symbolic name as part of the Target IQN on the iSNS server. This also helps users to recognize the target if multiple mpxs are registered with the same iSNS server.

```
System Symbolic Name (Max = 64 charac-
ters)                                          [              ] MPX100-65

Embed Symbolic Name (0=Enable,1=Disable)       [Disabled      ]0

System Log Level (Min = 0, Max = 3)            [0             ]
```

4. Reboot the mpx100/100b.

   The new attribute values are saved and in effect.

5. After enabling the iSCSI port for iSNS, verify that an iSCSI port target entry appears in the iSNS server database.

Example 1. iSNSCLI command issued on iSNS server

```
C:> isnscli listmodes

iqn.1986-03.com.hp:fcgw.mpx100:mpx100-65.1.
50001fe150002f70.50001fe150002f7f
```

Where:

iqn.1986-03.com.hp:fcgw.mpx100	The standard IQN name for all mpx100's/100b's
mpx100-65	Symbolic Name
1	iSCSI port number
50001fe150002f70.50001fe150002f7f	Presented EVA port

Installing the mpx100/100b firmware

The mpx100/100b ships with the latest firmware installed. You can upgrade the firmware from the management server. You can use the HP StorageWorks mpx Manager application or the CLI to install new firmware.

⚠ WARNING!

Installing and then activating the new firmware is disruptive. For activation, you must reboot the mpx100/100b. However, the reboot can result in incorrect data being transferred between devices connected to the mpx100/100b. HP recommends suspending activity on the interfaces before activating firmware.

For the latest mpx100/100b firmware, go to the HP website:

http://h18006.www1.hp.com/products/storageworks/evaiscsiconnect/index.html.

Using HP StorageWorks mpx Manager to install mpx100/100b firmware

To install the firmware using the HP StorageWorks mpx Manager:

1. Identify the mpx100/100b in the topology display. Double-click to open it.
2. Click **Select** in the Firmware Upload window and browse to select the firmware file to upload.
3. Click **Start** to begin the firmware load process. A message is displayed, warning you that the mpx100/100b will need to be rebooted to activate the firmware.
4. Click **OK** to continue the firmware installation, or click **Cancel** to stop the installation.

Using the CLI to install mpx100/100b firmware

To install the firmware using the CLI:

1. Download the latest firmware version and place it on a server that can access the mpx100/100b management port IP address.

2. FTP to the mpx100/100b management port and log in with the following information:

   ```
   Username: ftp
   Password: ftp
   ```

3. To set FTP for binary transfer, enter the following information:

   ```
   ftp> bin
   ftp> put mpx100-x_x_x_x.bin
   ftp> quit
   ```

4. Use Telnet to connect to the mpx100/100b and log in as `guest`.

   ```
   Username: guest
   Password: password
   ```

5. Set administrative privileges to allow for the firmware upgrade with the following information:

   ```
   mpx100> admin start
   password: config
   ```

6. Upgrade the mpx100/100b using the `image` command.

   ```
   mpx100 admin> image unpack mpx100-x_x_x_x.bin
   ```

7. Reboot the mpx100/100b for new firmware to take effect.

   ```
   mpx100 admin> reboot.
   ```

5 Setting up the iSCSI Initiator and storage

This chapter contains the following topics:

- iSCSI initiator setup, page 69
- iSCSI initiator setup for Windows (single-path), page 69
- Storage setup for Windows (single-path)
- About Microsoft Windows server 2003 scalable networking pack
- iSCSI Initiator setup for Apple Mac OS X (single-path)
- iSCSI initiator setup for Linux, page 79
- iSCSI initiator setup for Solaris (single-path), page 85
- iSCSI initiator setup for VmWare, page 89
- iSCSI initiator setup for OpenVMS, page 92

iSCSI Initiator setup

The IP host or iSCSI Initiator uses an iSCSI driver to enable target resource recognition and attachment to EVA iSCSI connectivity over IP. An iSCSI driver may be part of the operating system (software initiator) or embedded on an iSCSI HBA (hardware initiator). An iSCSI driver is configured with the Gigabit Ethernet IP address of each mpx100/100b iSCSI port with which the host is to transport SCSI requests and responses.

The iSCSI Initiator sees the EVA LUNs as if they were block-level drives attached directly to the server.

iSCSI Initiator setup for Windows (single-path)

To set up the iSCSI Initiator for Windows:

1. Install the iSCSI Initiator:
   a. Download the *HP StorageWorks iSCSI Connectivity Option for Enterprise Virtual Arrays software kit* from the HP website: http://h18006.www1.hp.com/products/storageworks/evaiscsiconnect/index.html . Select **Support for your product**, then **Download drivers and software**.

   NOTE:

   The software kit is available in a `.zip` or `.iso` file. You can write the `.iso` file to a CD-ROM or copy the `.zip` file to a folder.

   b. Insert the CD-ROM. Run `Launch.exe` if the CD-ROM does not start automatically.
   c. Click **Install iSCSI software package**, accept the default settings, and reboot the server.
   d. Click the Microsoft iSCSI Initiator icon on your desktop.
   The iSCSI Initiator Properties window opens.

NOTE:

The terms *initiator* and *host* are used interchangeably. The initiator is the host that is accessing the storage.

e. Click the **Discovery** tab, (Figure 23).

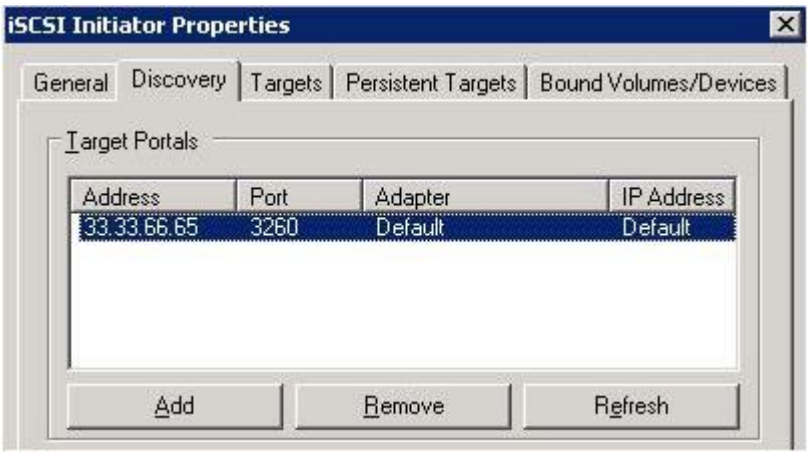


Figure 23 Adding an IP address

f. Click **Add** to add the IP address of Port 1 on the mpx100/100b.

g. Click **OK** to exit.

h. Click the **Targets** tab. The target status is `Inactive` (Figure 24).

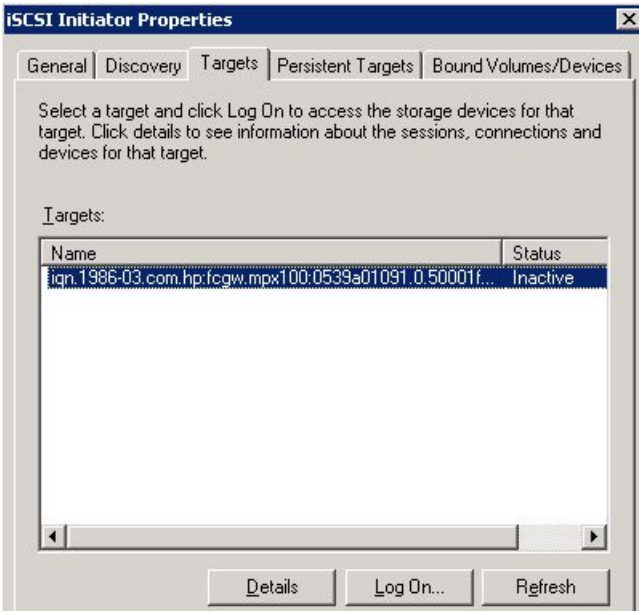


Figure 24 Inactive target status

i. Select a single target and then click **Log On**.

j. Click **Automatically restore this connection when the system boots** (do not enable multipath), and then click **OK** (Figure 25).

The target status is `Connected`.

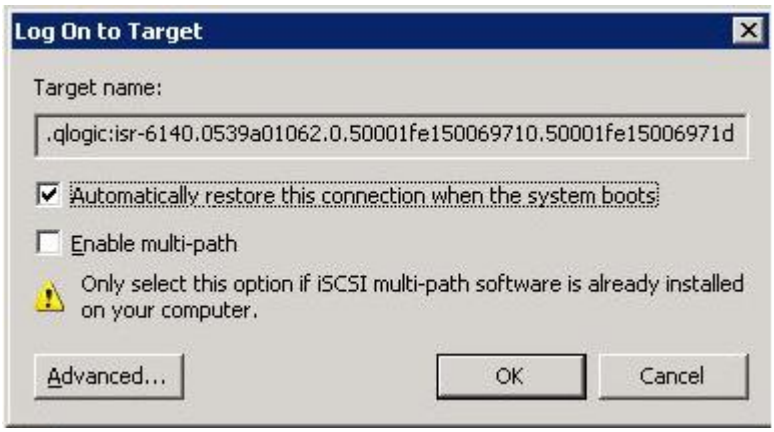


Figure 25 Connected target status

NOTE:

Each target represents a path to the EVA. Logging into multiple targets may inadvertently present the same LUN multiple times to the operating system.

Storage setup for Windows (single-path)

To set up LUNs using HP Command View:

1. Set up LUNs using HP Command View.
   See Using HP Command View EVA to configure LUNs to iSCSI initiators, page 127.
2. Set up the iSCSI drive on the iSCSI Initiator:
   a. Open the Windows Computer Management window.
   b. Select **Disk Management**.
   c. Select **Action > Rescan Disks**. The newly created Vdisk should appear as a disk to the operating system; if it does not, reboot the iSCSI Initiator.
   d. Format and partition the disk.

About Microsoft Windows server 2003 scalable networking pack

The Microsoft Windows Server 2003 Scalable Networking Pack contains functionality for offloading TCP network processing to hardware. *TCP Chimney* is a feature that allows TCP/IP processing to be offloaded to hardware. *Receive Side Scaling* allows receive packet processing to scale across multiple CPUs.

HP's NC3xxx Multifunction Gigabit server adapters and Alacritech's SES2xxxxx adapters support TCP offload functionality using Microsoft's Scalable Networking Pack (SNP).

For more support details, read the latest HP adapter information for more support details.

To download the SNP package and for more details see: http://support.microsoft.com/kb/912222.

SNP setup with HP NC 3xxx GbE multifunction adapter

Microsoft's Scalable Networking Pack works in conjunction with HP's NC3xxxx Multifunction Gigabit server adapters and Alacritech's SES2xxxxx adapter for Windows 2003 only.

To set up SNP on a Windows 2003 server:

1. Install the hardware and necessary software for the NC3xxx Multifunction Gigabit server adapter, following the manufacturer's installation procedures.
2. Download the SNP package from the Microsoft website: http://support.microsoft.com/kb/912222.
   a. To start the installation immediately click **Run**, or
   b. To copy the download to your computer for installation at a later time, click **Save**.

   A reboot is required after successful installation.
3. After reboot, verify TCP offload settings by opening a Command Prompt window and issuing the command:

```
C:\>netsh interface ip show offload

The following is displayed:

Offload Options for interface "33-IP Storage Subnet" with index: 10003:

TCP Transmit Checksum

IP Transmit Checksum

TCP Receive Checksum

IP Receive Checksum

TCP Large Send TCP Chimney Offload.
```

4. To modify TOE Chimney settings, use the commands:

```
>netsh int ip set chimney enabled

>netsh int ip set chimney disabled
```

   For more information, go to:

   http://support.microsoft.com/kb/912222

iSCSI Initiator setup for Apple Mac OS X (single-path)

The EVA4400 and EVA connectivity option supports the Macintosh Xtend iSCSI Initiator provided by ATTO Technologies. For more details please visit http://www.attotech.com.

Set up the iSCSI Initiator for Apple Mac OS X

1. Install the ATTO iSCSI Macintosh Initiator following the install instructions provided by the vendor.

2. Run the Xtend SAN application to discover and configure the EVA iSCSI targets. The Xtend SAN iSCSI Initiator can discover targets either by static address or iSNS.

   For static address discovery:

   a. Select **Discover Targets** and then select **Discover by DNS/IP** (Figure 26).

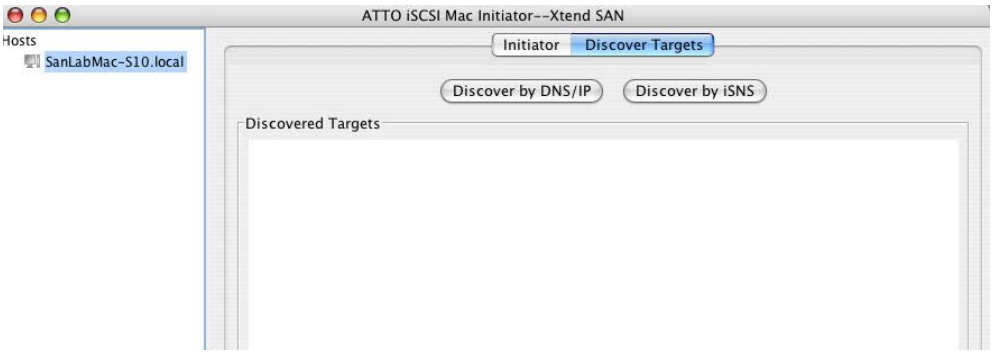


Figure 26 Discover targets

   b. Add the static IP address of the mpx iSCSI port in the Address field and then select **Finish** (Figure 27).

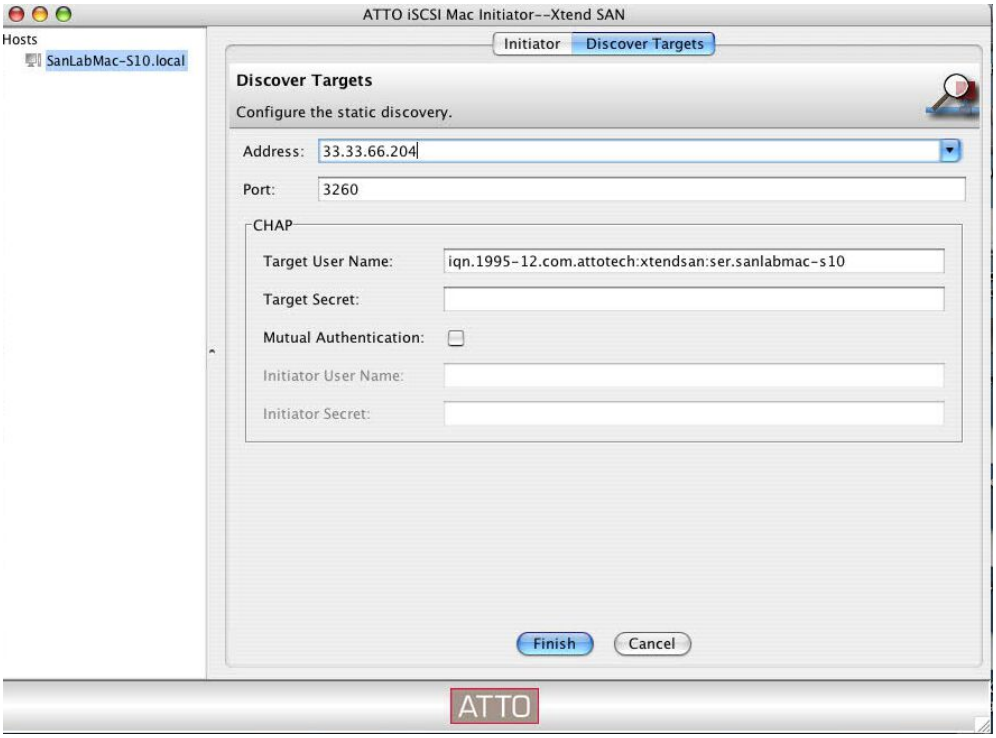


Figure 27 Add static IP address

   c. Select a target from the Discovered Target list and then click **Add** (Figure 28).

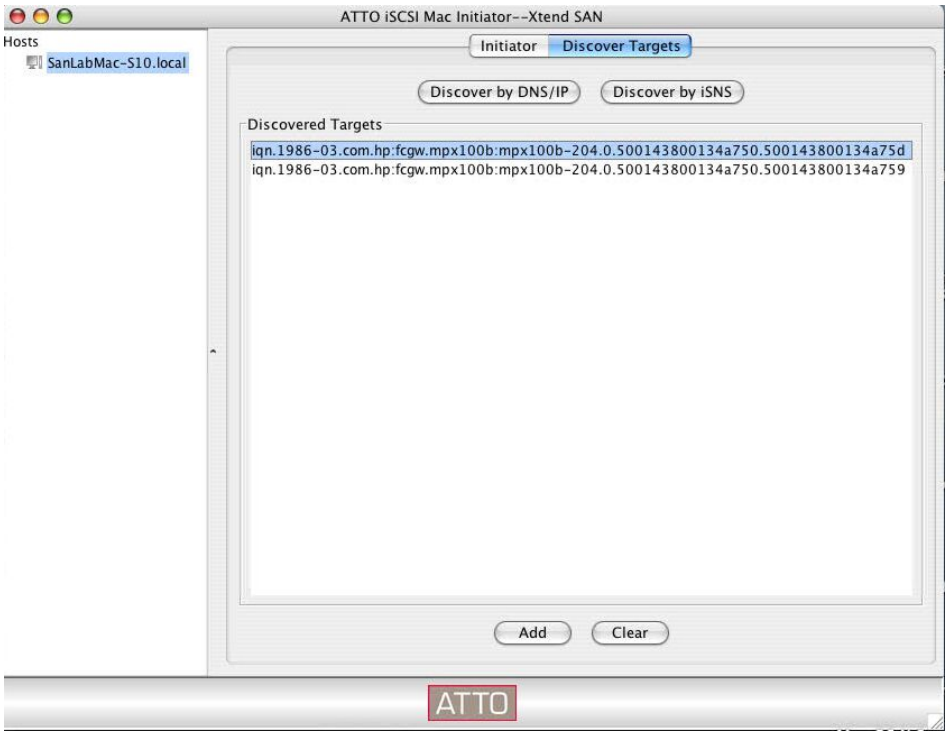


Figure 28 Discovered target list

NOTE:

The mpx iSCSI port may present several iSCSI targets to the Xtend SAN iSCSI Initiator. Select only one target from the list.

3. For iSNS discovery:

   a. Select **Initiator** and then enter the iSNS name or IP address in the **iSNS Address** field (Figure 29).

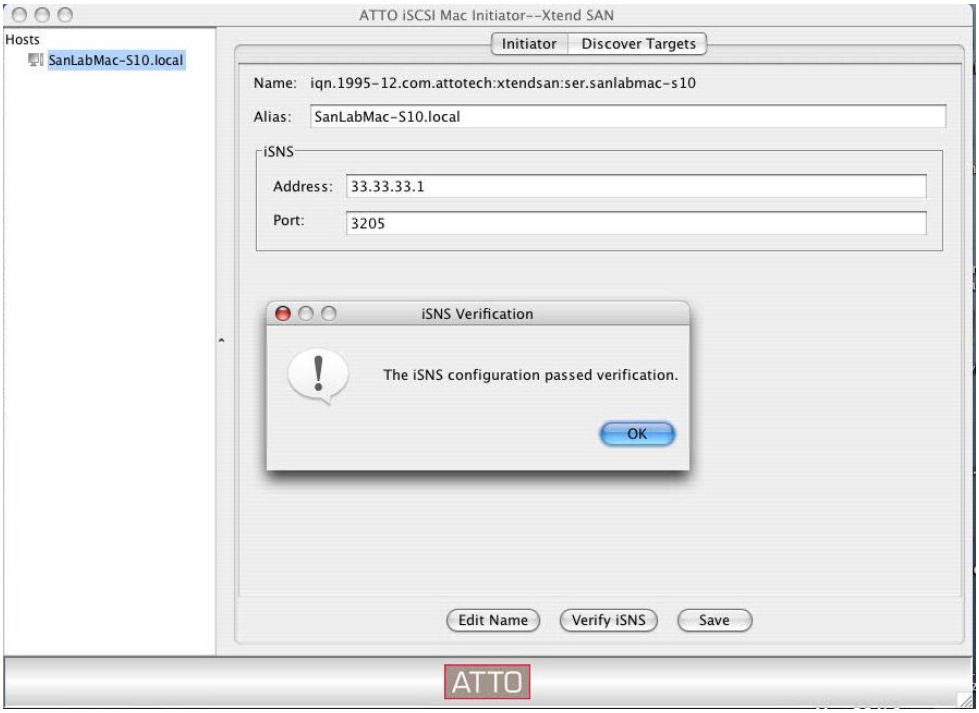


Figure 29 iSNS discovery and verification

   b. Test the connection from the initiator to the iSNS server by selecting **Verify iSNS**. If successful, select **Save**.

      If necessary, working on the iSNS server, make the appropriate edits to add the Xtend SAN iSCSI Initiator to any iSNS discovery domains that include mpx iSCSI targets.

   c. Select **Discover Targets**.

   d. Select **Discover by iSNS**.

      A list of mpx targets appears under **Discovered Targets** (Figure 30).

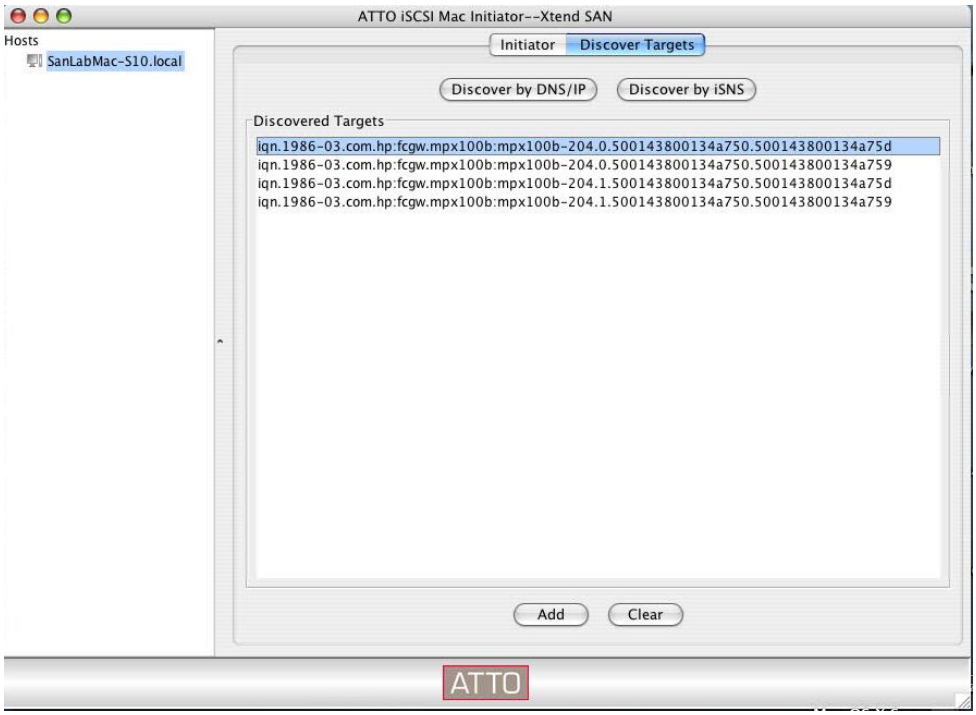


Figure 30 Discovered targets

NOTE:

The mpx iSCSI port may present several iSCSI targets to the Xtend SAN iSCSI Initiator. Select only one target from the list.

e. Select the newly-added target under Host name in the left frame.

f. Check the **Visible** box (Figure 31). This allows the initiator to display the target status.

g. Check the **Auto Login** box. This configures the iSCSI Initiator to automatically log in to the iSCSI target at system startup.

h. Click **Save**.

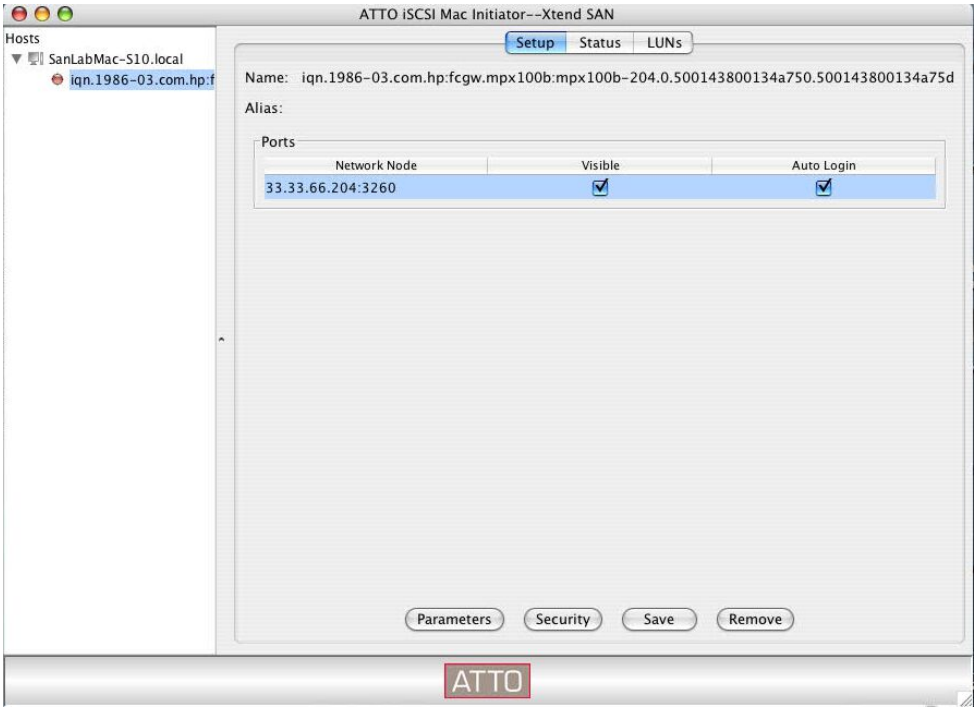


Figure 31 Selecting newly added target

i. Select **Status**, select **Network Node**, and then select **Login** to connect to the mpx target (Figure 32).

The Network Node displays a status of `Connected` and the target status light turns green.

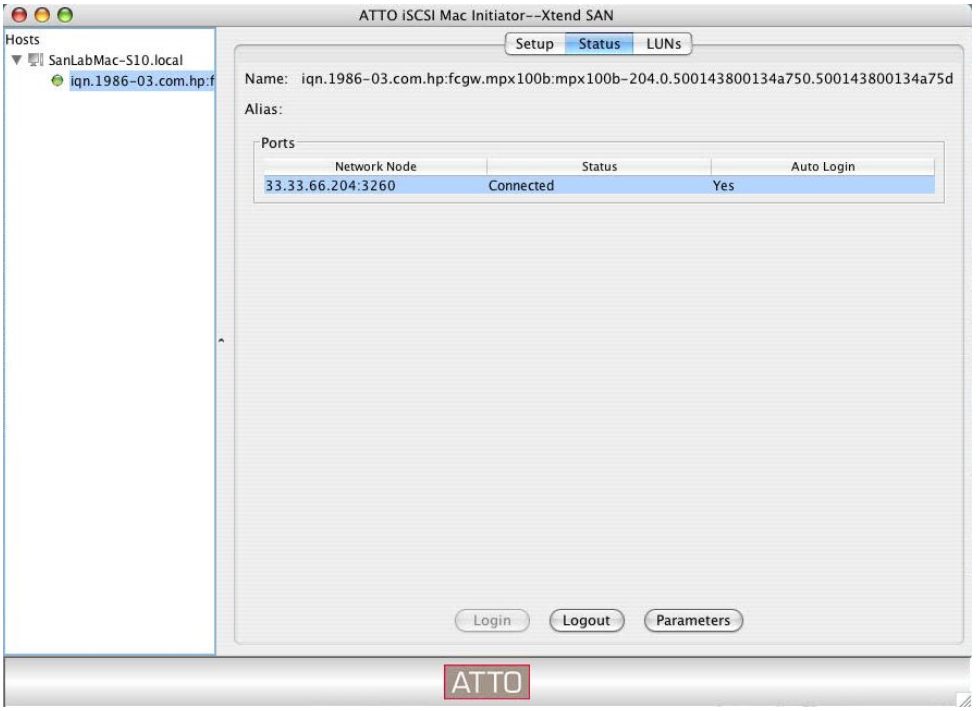


Figure 32 Select status

Storage setup for Apple Mac OS X

1. Present LUNs using HP Command View EVA.

   See Using HP Command View EVA to configure LUNs to iSCSI initiators, page 127.

2. Verify that the EVA LUNs are presented to the Macintosh iSCSI Initiator:

   a. Open the Xtend SAN iSCSI application.

   b. Select the mpx100b target entry under the host name.

   c. Click the **LUNs** button.

      A list of presented EVA LUNs is displayed (Figure 33).

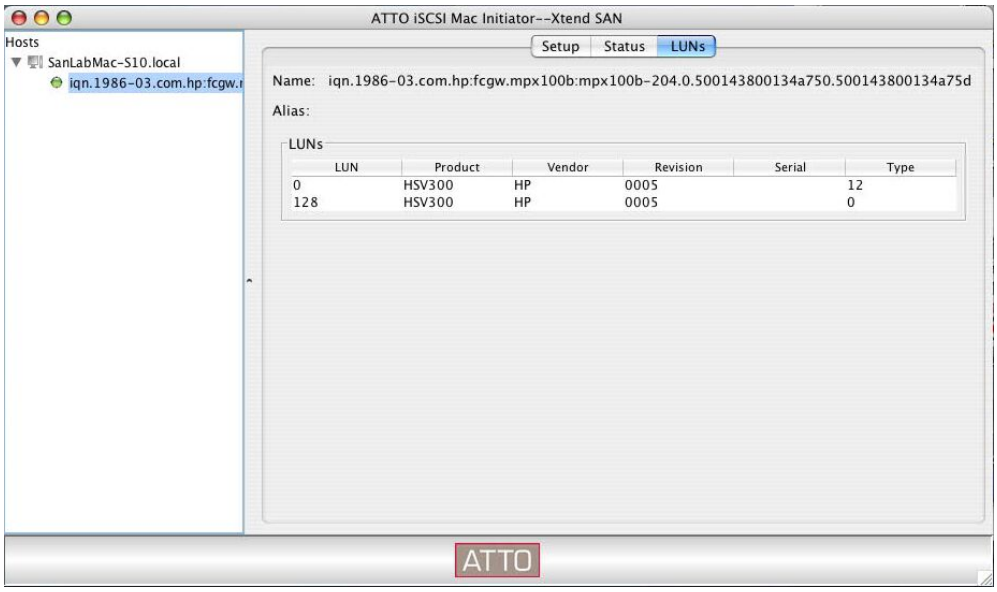


Figure 33 Presented EVA LUNs

NOTE:

If no LUNs appear in the list, log out and then log in again to the target, or a system reboot may be required.

3. Set up the iSCSI drive on the iSCSI Initiator:

   a. Open Disk Utilities from the Apple Max OS X Finder Applications list.

   b. Format and partition the EVA LUN as needed.

iSCSI Initiator setup for Linux

Installing and configuring the SUSE Linux Enterprise 10 iSCSI driver

Configure the initiator using the built-in GUI-based tool or the open-iscsi administration utility using the `iscsiadm` command. See the `iscsiadm (8)` man pages for detailed command information.

1. Modify the Initiator Name by issuing the following command:

   ```
   # vi /etc/initiatorname.iscsi
   ```

2. To configure the Initiator and Targets, start the iSCSI Initiator applet by finding it in the YaST Control Center under **Network Services**, and then set the service to start at boot time (Figure 34).

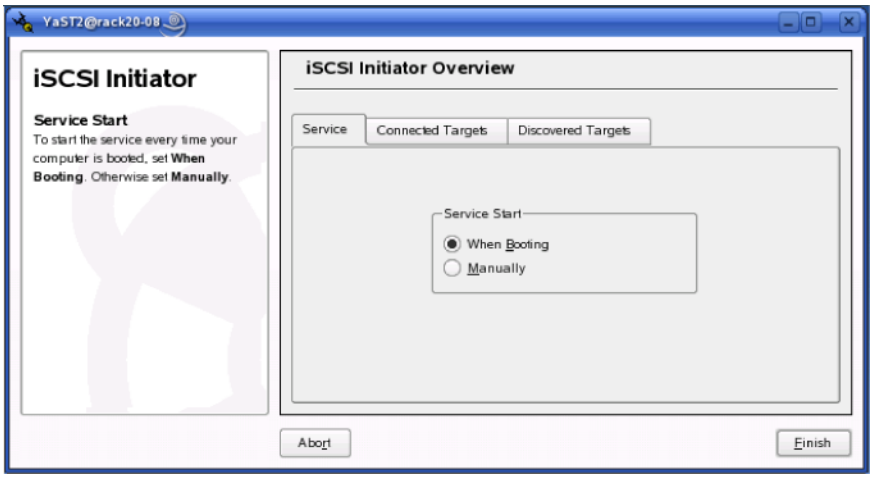


Figure 34 Configure initiator and targets

3. Click the **Discovered Targets** tab and enter your iSCSI target IP address (Figure 35).

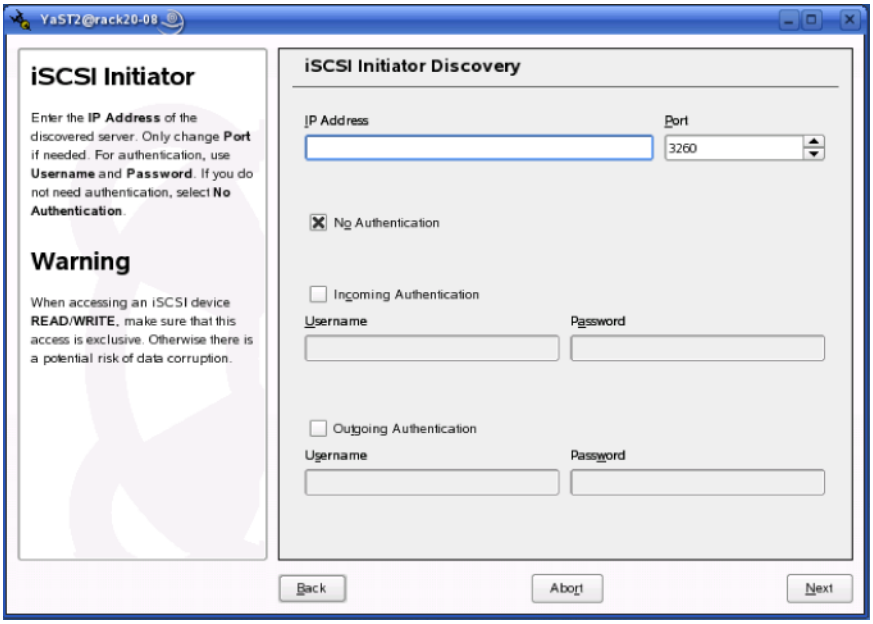


Figure 35 Discovered Targets tab

4. Log in to the target (Figure 36).

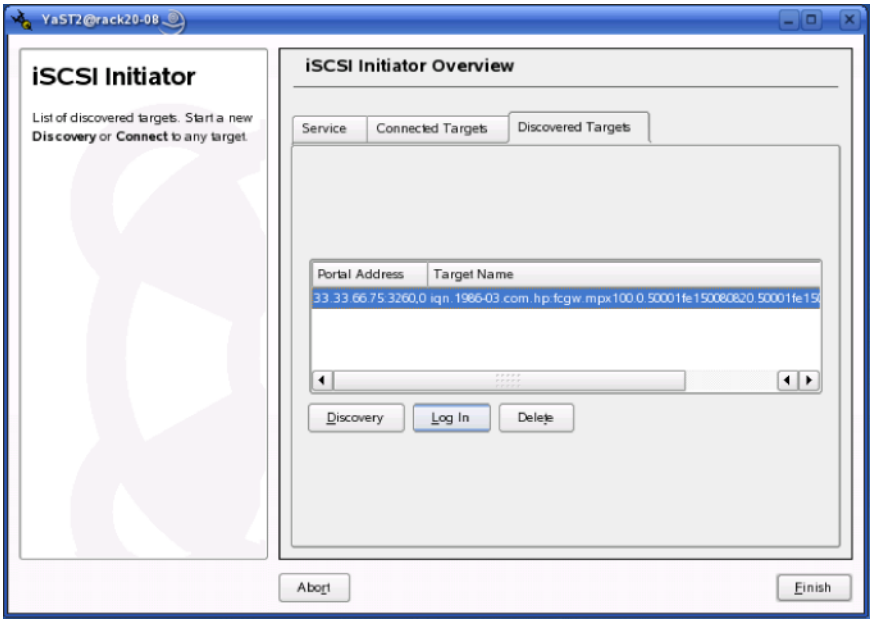


Figure 36 Target login

5. Click the **Connected Targets** tab, and then click the **Toggle Start-Up** button on each target listed so the targets start automatically (Figure 37).

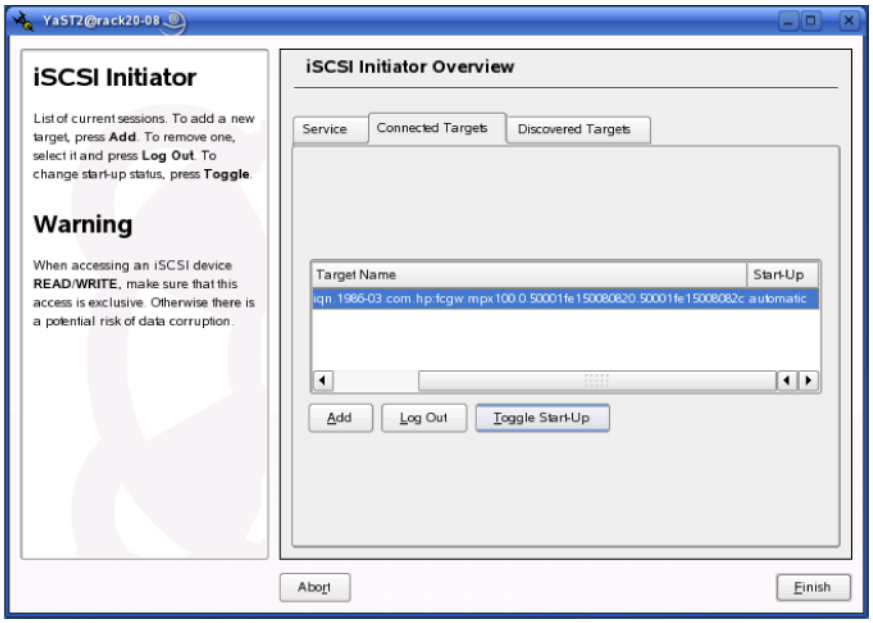

YaST2@rack20-08
iSCSI Initiator
List of current sessions. To add a new target, press Add. To remove one, select it and press Log Out. To change start-up status, press Toggle.
Warning
When accessing an iSCSI device READ/WRITE, make sure that this access is exclusive. Otherwise there is a potential risk of data corruption.
iSCSI Initiator Overview
Service
Connected Targets
Discovered Targets
Target Name
Start-Up
iqn.1986-03.com.hp:fcgw.mpx100.0.50001fe150080820.50001fe15008082c automatic
Add
Log Out
Toggle Start-Up
Abort
Finish

Figure 37 Connected Targets tab

Installing and configuring for Red Hat 5

To install and configure for Red Hat 5:

NOTE:

The iSCSI driver package is included but is not installed by default. Install the package named iscsi-initiator-utils-6.2.0.742-0.5.e15 during or after operating system installation.

1. Use the `iscsiadm` command to control discovery and connectivity:

   ```
   # iscsiadm –m discovery –t st –p 10.6.0.33:3260
   ```

2. Edit the initiator name:

   ```
   # vi /etc/iscsi/initiatorname.iscsi
   ```

3. To start the iSCSI service use the `service` command:

   ```
   # service iscsi start
   ```

4. Verify that the iSCSI service autostarts:

   ```
   #chkconfig iscsi on
   ```

NOTE:

For more detail, see the man pages regarding the iscsiadm open-iscsi administration utility.

Installing and configuring for Red Hat 3, 4 and SUSE 8 and 9

To install and configure for Red Hat 3 and 4 and for SUSE 8 and 9:

NOTE:

The iSCSI driver is included with the Red Hat 4 and SUSE 9 distributions and is installed by default. Configuration is the same for Red Hat 3, 4, SUSE 8 and 9.

1. Update `/etc/iscsi.conf` to include the IP address of your iSCSI target. A sample configuration file might include entries like this:

   DiscoveryAddress=33.33.33.101

   For a more detailed description of the configuration file format, enter:

   ```
   man iscsi.conf
   ```

2. Enter the following command to manually start iSCSI services to test your configuration:

   ```
   /etc/init.d/iscsi start
   ```

3. Modify the `/etc/initiatorname.iscsi` file to reflect a meaningful name for the initiator. For example:

   ```
   InitiatorName=iqn.1987-05.com.cisco:servername.yourcompany.com
   ```

   NOTE:

   In most cases, the only part of the file requiring modification is after the colon.

If there are problems starting the iscsi daemon, they are usually caused by an incorrect IP Address or an ill-formatted initiator name.

Installing the initiator for Red Hat 3 and SUSE 8

If you are upgrading from a previous installation of an iSCSI driver, HP recommends that you remove the `/etc/initiatorname.iscsi` file before installing the new driver. See the following website for the latest version of the Linux driver for EVA iSCSI connectivity:

http://sourceforge.net/projects/linux-iscsi

NOTE:

The Linux driver supports both Red Hat 3 and SUSE 8. See the *Readme* file in the tar ball for more information on how to configure the Linux iSCSI Initiator.

Installing the iSCSI driver

In a newly installed Red Hat Linux kernel, an iSCSI instance may be running. Before installing the iSCSI driver, you must stop the instance.

To stop the instance:

1. Run setup.
2. Deselect iSCSI.
3. Reboot the system.

See the *Readme* file in the tar ball for more information on configuring the iSCSI Initiator.

To install the iSCSI driver:

1. Use `tar(1)` to decompress the source archive into a directory of your choice. The archive contains a subdirectory corresponding to the archive name. Use the following commands to decompress the source archive:

   ```
   cd /usr/src

   tar xvzf /path/to/linux-iscsi-version.tgz

   cd linux-iscsi-<version>
   ```

2. Compile the iSCSI driver. If your kernel sources are not in the usual place, add `TOPDIR=/path/to/kernel` or edit the definition of `TOPDIR` in `Makefile`. Use the `Make` command to edit `Makefile`.
3. Install the driver as `root`. If you are currently using the iSCSI driver, first unmount all iSCSI devices and unload the old iSCSI driver. If your Linux distribution includes an iSCSI driver, it may be necessary to uninstall that package first.
4. Configure the driver. See Installing and configuring for RedHat 3, 4 and SuSE 8 and 9, page 81.

Assigning device names

Because Linux assigns SCSI device nodes dynamically whenever a SCSI logical unit is detected, the mapping from device nodes such as `/dev/sda` or `/dev/sdb` to iSCSI targets and logical units may vary.

Variations in process scheduling and network delay can result in iSCSI targets being mapped to different SCSI device nodes every time the driver is started. Because of this variability, configuring applications or operating system utilities to use the standard SCSI device nodes to access iSCSI devices can result in sending SCSI commands to the wrong target or logical unit.

To provide consistent naming, the iSCSI driver scans the system to determine the mapping from SCSI device nodes to iSCSI targets. The iSCSI driver creates a tree of directories and symbolic links under `/dev/iscsi` to make it easier to use a particular iSCSI target's logical unit.

The directory tree under `/dev/iscsi` contains subdirectories for each iSCSI bus number, each target id number on the bus, and each logical unit number for each target. For example, the whole disk device for `bus 0`, `target ID 0`, and `LUN 0` would be `/dev/iscsi/bus0/target0/LUN0/disk`.

In each logical unit directory there is a symbolic link for each SCSI device node that can be connected to that particular logical unit. These symbolic links are modeled after the Linux `devfs` naming convention:

- The symbolic link `disk` maps to the whole-disk SCSI device node such as `/dev/sda` or `/dev/sdb`.
- The symbolic links `part1` through `part15` maps to each partition of that SCSI disk. For example, a symbolic link can map to partitions `/dev/sda1`, `dev/sda15`, or to as many partitions as necessary.

NOTE:

These symbolic links exist regardless of the number of disk partitions. Opening the partition devices results in an error if the partition does not actually exist on the disk.

- The symbolic link `mt` maps to the auto-rewind SCSI tape device node for the LUN `/dev/st0`, for example. Additional links for `mtl`, `mtm`, and `mta` map to the other auto-rewind devices `/dev/st0l`, `/dev/st0m`, `/dev/st0a`, regardless of whether these device nodes actually exist or could be opened.
- The symbolic link `mtn` maps to the no-rewind SCSI tape device node, if any. For example, this LUN maps to `/dev/nst0`. Additional links `formtln`, `mtmn`, and `mtan` map to the other no-rewind devices such as `/dev/nst0l`, `/dev/nst0m`, `/dev/nst0a`, regardless of whether those device nodes actually exist or could be opened.
- The symbolic link `cd` maps to the SCSI CD-ROM device node, if any, for the LUN `/dev/scd0` for example.
- The symbolic link `generic` maps to the SCSI generic device node, if any, for the LUN `/dev/sg0`.

Because the symlink creation process must open all of the SCSI device nodes in `/dev` in order to determine which nodes map to iSCSI devices, you may see many `modprobe` messages logged to `syslog` indicating that `modprobe` could not find a driver for a particular combination of major and minor numbers. This message can be ignored. The messages occur when Linux is unable to find a driver to associate with a SCSI device node that the iSCSI daemon is opening as part of its `symlink` creation process. To prevent these messages from occurring, remove the SCSI device nodes that do not contain an associated high-level SCSI driver.

Target bindings

The iSCSI driver automatically maintains a bindings file, `/var/iscsi/bindings`. This file contains persistent bindings to ensure that the same iSCSI bus and target ID number are used for every iSCSI session with a particular iSCSI `TargetName`, even when the driver is repeatedly restarted.

This feature ensures that the SCSI number in the device `symlinks` (described in "Device names" on page 82) always map to the same iSCSI target.

NOTE:

Because of the way Linux dynamically allocates SCSI device nodes as SCSI devices are found, the driver does not and cannot ensure that any particular SCSI device node `/dev/sda`, for example, always maps to the same `iSCSI TargetName`. The `symlinks` described in "Device names" on page 82 are intended to provide application and `fstab` file persistent device mapping and must be used instead of direct references to particular SCSI device nodes.

If the bindings file grows too large, lines for targets that no longer exist may be manually removed by editing the file. Manual editing should not be needed, however, since the driver can maintain up to 65,535 different bindings.

Mounting file systems

Because the Linux boot process normally mounts file systems listed in `/etc/fstab` before the network is configured, adding mount entries in iSCSI devices to `/etc/fstab` will not work. The `iscsi-mountall` script manages the checking and mounting of devices listed in the file `/etc/fstab.iscsi`, which has the same format as `/etc/fstab`. This script is automatically invoked by the iSCSI startup script.

NOTE:

If iSCSI sessions are unable to log in immediately due to network or authentication problems, the `iscsi-mountall` script can time out and fail to mount the file systems.

Mapping inconsistencies can occur between SCSI device nodes and iSCSI targets, such as mounting the wrong device due to device name changes resulting from iSCSI target configuration changes or network delays. Instead of directly mounting SCSI devices, HP recommends one of the following options:

- Mount the `/dev/iscsi tree symlinks`.
- Mount file system UUIDs or labels (see man pages for `mke2fs`, `mount`, and `fstab`).
- Use logical volume management (see Linux LVM).

Unmounting file systems

It is very important to `unmount` all file systems on iSCSI devices before the iSCSI driver stops. If the iSCSI driver stops while iSCSI devices are mounted, buffered writes may not be committed to disk, and file system corruption can occur.

Since Linux will not `unmount` file systems that are being used by a running process, any processes using those devices must be stopped (see `fuser(1)`) before iSCSI devices can be unmounted.

To avoid file system corruption, the iSCSI shutdown script automatically stops all processes using devices in `/etc/fstab.iscsi`, first by sending them SIGTERM, and then by sending any remaining processes SIGKILL. The iSCSI shutdown script unmounts all iSCSI file systems and stops the iSCSI daemon, terminating all connections to iSCSI devices.

△ CAUTION:

File systems not listed in `/etc/fstab.iscsi` cannot be automatically unmounted.

Presenting EVA storage for Linux

To set up LUNs using HP Command View:

1. Set up LUNs using HP Command View. For procedure steps, see "Using HP Command View EVA to configure LUNs to iSCSI initiators" on page 127.
2. Set up the iSCSI drive on the iSCSI Initiator:
   a. Restart the iSCSI services:
      ```
      /etc/rc.d/initd/iscsi restart
      ```
   b. Verify that the iSCSI LUNs are presented to the operating system by entering the following command:
      ```
      fdisk -l
      ```

iSCSI Initiator setup for Solaris (single-path)

The Solaris iSCSI driver is included in the Solaris 10 operating system with the following software packages:

- SUNWiscsir–Sun iSCSI Device Driver (root)
- SUNWiscsiu–Sun iSCSI Management Utilities (usr)

EVA LUN 0 with Solaris iSCSI Initiators

By default, LUN 0 is assigned to an iSCSI Initiator when the initiator logs in to the mpx100b iSCSI target and when HP Command View EVA presents a virtual disk to an iSCSI host.

Because the Solaris iSCSI Initiator does not recognize LUN 0 as the EVA controller console LUN, the initiator tries to bring LUN 0 online, resulting in the following warning:

```
Mar 21 08:04:09 hdxs8j iscsi: [ID 248668 kern.warning] WARNING: iscsi
driver unable to online iqn.1986-03.com.hp:fcgw.mpx100:hdxh05-m2.0.50001
fe1500aef60.50001aef68 LUN 0
```

LUN 0 can be prevented from being sent to the Solaris iSCSI Initiator by disabling the Controller LUN AutoMap parameter with the mpx system settings.

LUN 0 is not presented to any host entry in HP Command View 8.0 with any iSCSI host mode setting of Solaris.

Disabling Controller LUN AutoMap using the mpx CLI

To disable Controller LUN AutoMap using the CLI:

1. Use Telnet to connect to the mpx management port or connect to the mpx serial port using the HP-supplied connector.

   The mpx management port's default IP address is 10.0.0.1/255.0.0.0. The mpx serial port's default setting is 115200/8/n/1.

2. To log in, enter:
   - User name: `guest`
   - Password: `password`
3. To enable administrator privileges, enter:
   - `admin start`
   - `config`
4. Issue the `Set System` command.
5. Follow the prompts to disable Controller LUN AutoMap.

   The following is an example of the `set system` command:

```
mpx100b (admin) #> set system

A list of attributes with formatting and current values will follow.
Enter a new value or simply press the Enter key to accept the current value.
If you wish to terminate this process before reaching the end of the list
press 'q' or 'Q' and the Enter key to do so.

WARNING:
If enabled by operator, the Symbolic Name can be embedded as part of the
only valid iSCSI name characters will be accepted. Valid characters include
alphabetical (a-z, A-Z), numerical (0-9), colon, hyphen, and period.

Changes to the settings below will be effective after a reboot.

System Symbolic Name (Max=64 characters)      [mpx100-66   ]
Embed Symbolic Name (0=Enable, 1=Disable)      [Enabled   ]
Controller Lun AutoMap (0=Enable, 1=Disable)  [Disabled   ]1
System Log Level (Min=0, Max=3)               [0           ]

All attribute values that have been changed will now be saved.

mpx100b (admin) #>
```

NOTE:

In the Warning message above, the first sentence is intended to read: "If enabled by the operator, the Symbolic Name can be embedded as part of the *target IQN name, but* only valid iSCSI name characters are accepted."

Prepare for a Solaris iSCSI configuration

Complete the following tasks before starting a Solaris iSCSI configuration:

1. Become a superuser.

2. Verify that the iSCSI software packages are installed:

```
# pkginfo SUNWiscsiu SUNWiscsir
system SUNWiscsiu Sun iSCSI Device Driver (root)
system SUNWiscsir Sun iSCSI Management Utilities (usr)
```

3. Verify that you are running a Solaris 10 1/06 or later release.
4. Confirm that your TCP/IP network is set up.

Configure for EVA iSCSI target discovery

This procedure assumes that you are logged in to the local system where you want to configure access to an iSCSI target device. The EVA target can be discovered by either using the IP address of the MPX iSCSI port or using an iSNS server address.

Set target discovery using MPX iSCSI port address

To set target discovery using the MPX iSCSI port address:

1. Become a superuser.
2. Add the ip address of the mpx iSCSI port to the initiator's discovery list:

```
# iscsiadm add discovery-address 33.33.66.64
```

3. Enable the SendTargetsdiscovery method:

```
# iscsiadm modify discovery --sendtargets enable
```

4. Create the iSCSI device links for the local system:

```
# devfsadm -i iscsi
```

5. Verify that mpx targets are available to the initiator:

```
# iscsiadm list target
```

NOTE:

The iSCSI connection is not initiated until the discovery method is enabled.

Set target discovery using iSNS server address

To set target discovery using the iSNS server address:

1. Become a superuser.
2. Add the ip address of the iSNS server to the initiator's discovery list:

```
# iscsiadm add iSNS-server 33.33.66.64
```

3. Enable iSNS discovery method:

```
# iscsiadm mod discovery -isns enable
```

4. Enable the `SendTargets` discovery method:

```
# iscsiadm modify discovery --sendtargets enable
```

5. Create the iSCSI device links for the local system:

   ```
   # devfsadm -i iscsi
   ```

6. Verify mpx targets are available to the initiator:

   ```
   # iscsiadm list target
   ```

NOTE:

The iSCSI connection is not initiated until the discovery method is enabled.

For more details on using the `iscsiadm` command, see the `#man iscsiadm` man pages. For more details on iSCSI Initiator setup, see *Sun Microsystems System Administration Guide*, Devices and File Systems, Section 15.

Creating an iSCSI host and virtual disks for the Solaris iSCSI Initiator

See Using HP Command View EVA to configure LUNs to iSCSI initiators, page 127, to create an iSCSI host entry and to present LUNs to an iSCSI host in HP Command View. The host mode setting for Solaris is Linux/Mac.

Accessing iSCSI disks

If you want to make the iSCSI drive available on reboot, create the file system and add an entry to the `/etc/vfstab` file as you would with a UFS file system on a SCSI device.

After the devices have been discovered by the Solaris iSCSI Initiator, the login negotiation occurs automatically. The Solaris iSCSI driver determines the number of LUNs available and creates the device nodes. Then, the iSCSI devices can be treated as any other SCSI device.

You can view the iSCSI disks on the local system with the format utility, for example:

```
# format
AVAILABLE DISK SELECTIONS:
0. c0t1d0<SUN72G cyl 14087 alt 2 hd 24 sec 424>
/pci@8,600000/SUNW,qlc@4/fp@0,0/ssd@w500000e010685cf1,0
1. c0t2d0<SUN72G cyl 14087 alt 2 hd 24 sec 424>
/pci@8,600000/SUNW,qlc@4/fp@0,0/ssd@w500000e0106e3ba1,0
2. c3t0d0 <ABCSTORAGE-100E-00-2.2 cyl 20813 alt 2 hd 16 sec 63>
/iscsi/disk@0000iqn.2001-05.com.abcstorage%3A6-8a0900-477d70401-
b0fff044352423a2-hostname-020000,0
3. c3t1d0 <ABCSTORAGE-100E-00-2.2 cyl 20813 alt 2 hd 16 sec 63>
/iscsi/disk@0000iqn.2001-05.com.abcstorage%3A6-8a0900-3fcd70401
-085ff04434f423a2-hostname-010000,0
.
.
```

.

Monitoring your iSCSI configuration

Display information and modify settings on the iSCSI Initiator and target devices by using the following commands:

```
iscsiadm list initiator-node

iscsiadm list discovery

iscsiadm list target

iscsiadm list target-param

iscsiadm modify initiator-node

iscsiadm modify discovery

iscsiadm modify target-param
```

For more details on using the `iscsiadm` command, see the `#man iscsiadm` man pages. For more details on iSCSI Initiator setup, see:

Sun Microsystems System Administration Guide, Devices and File Systems, Section 15

iSCSI Initiator setup for VMware

The software iSCSI Initiator is built into the ESX server's VMkernel and uses standard GigE NICs to connect to the mpx100/100b.

To setup software based iSCSI storage connectivity:

1. Install the appropriate license from VMware to enable iSCSI software driver as per the instructions by VMware.

2. Configure the VMKernel TCP/IP networking stack for iSCSI support. Configure the VMkernel, service console with dedicated virtual switch with a dedicated NIC for iSCSI data traffic. Follow the instructions from VMware. Figure 38 shows an example of a configuration.

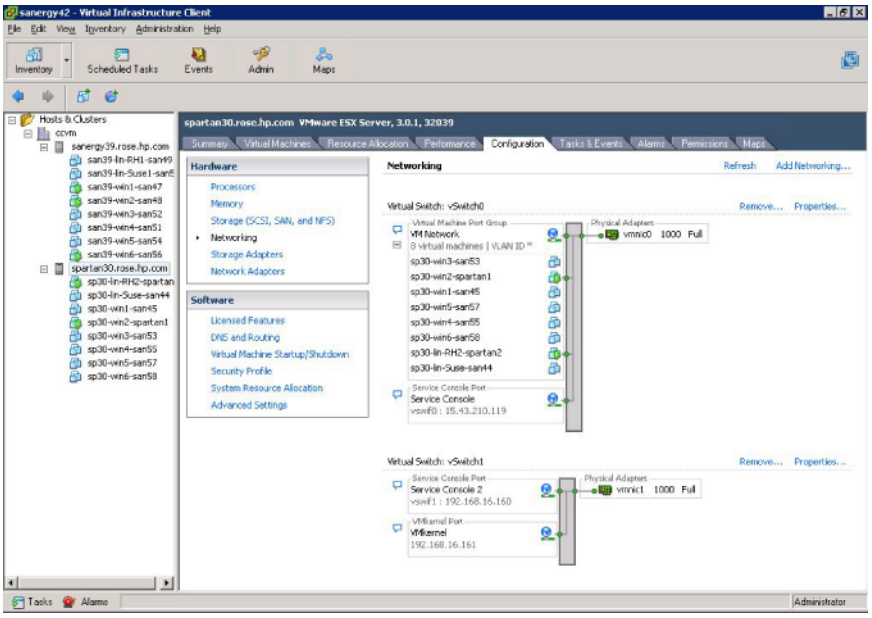


Figure 38 Configuration tab

3. Open a firewall port by enabling the iSCSI software client service.
   a. Using VMware's VI client, select the server.
   b. Click the **Configuration** tab, and then click **Security Profile**.
   c. Select the check box for iSCSI service to enable iSCSI traffic.
   d. Click **OK** (Figure 39).

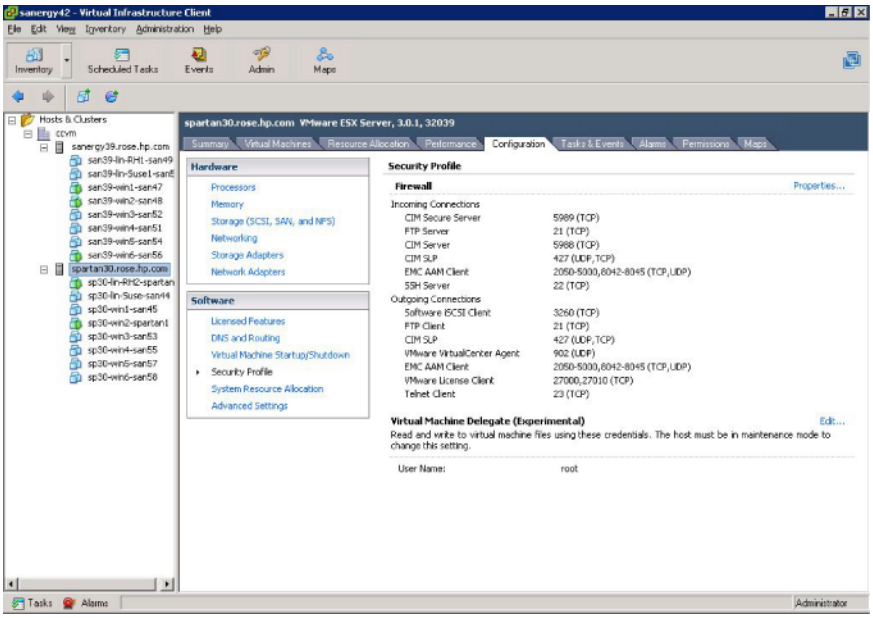


Figure 39 Security profile information

4. Enable the iSCSI software initiators:
   a. In VMware's VI client, select the server from the inventory panel.
   b. Click the **Configuration** tab, and then click **Storage Adapters** under Hardware.
   c. Under **iSCSI software Adapter**, choose the available software initiator.
   d. Click the **Properties** link of the software adapter.
   e. The **iSCSI initiator properties** dialog box is displayed. Click **Configure**.
   f. The **General properties** dialog box displays (Figure 40). Select the **Enabled** checkbox .

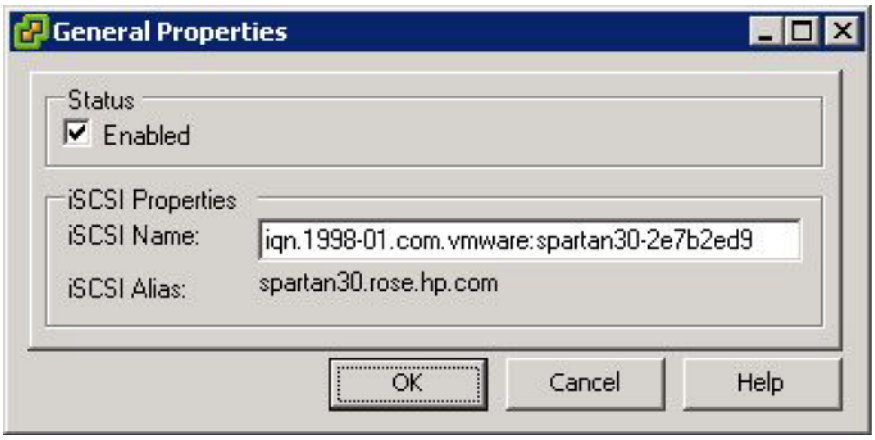


Figure 40 General properties dialog box

   g. Click **OK**.
5. Set up Discovery Addressing for the software initiator:
   a. Repeat Step 4 to open the **iSCSI initiator Properties** dialog box.
   b. Click the **Dynamic Discovery** tab.
   c. Click **Add** to add a new iSCSI target. The **Add Send Target Server** dialog box is displayed.
   d. Enter the mpx100's/100b's iSCSI IP address (Figure 41) and then click **OK**.

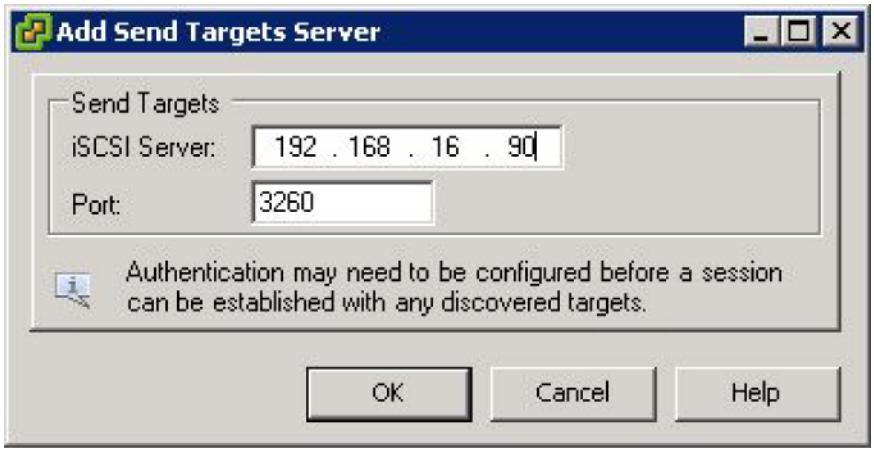


Figure 41 Add send targets server dialog box

6. See Creating an iSCSI initiator host via HP Command View EVA, page 128 for instructions to change the host mode of the VMware initiator to VMware.

7. See iSCSI initiator setup for Windows (single-path) for instructions to set up LUNs using HP Command View.
8. To verify that the LUNs are presented to the VMware host:
   a. Rescan for new iSCSI LUNs.
   b. In VMware's VI client, select a server and click the **Configuration** tab.
   c. Choose Storage Adapters in the hardware panel and click **Rescan** above the Storage Adapters panel.

      The Rescan dialog box displays; see Figure 42.
   d. Select the **Scan for New Storage Devices** and the **Scan for New VMFS Volumes** checkboxes.
   e. Click **OK**.

      The LUNs are now available for ESX server.

Rescan
Scan for New Storage Devices
Rescan all virtual machine host bus adapters for new storage devices. Rescanning all adapters can be slow.
Scan for New VMFS Volumes
Rescan all known storage devices for new VMFS volumes that have been added since the last scan. Rescanning known storage for new filesystems is faster than rescanning for new storage.
OK
Cancel
Help

Figure 42 Rescan dialog box

NOTE:

When presenting iSCSI storage to Virtual Machines you must:

- Create Virtual Machines using LSI Logic emulation.
- Present iSCSI storage to a Virtual Machine either as a data store created on a iSCSI device, or raw device mapping.

iSCSI Initiator setup for OpenVMS

Beginning with OpenVMS V8.3-1H1, the OpenVMS Software-Based iSCSI Initiator TDK is included as part of the standard OpenVMS installation. The processes for configuring and enabling the initiator are detailed in the following sections:

- Configuring TCP/IP services, page 93
- Configuring VLANs, page 93
- Enabling Ethernet jumbo frames, page 93

- Configuring target discovery, page 93
- Starting the iSCSI Initiator, page 95
- Stopping the iSCSI Initiator, page 96
- Setting up storage for OpenVMS, page 96

Configuring TCP/IP services

Before you start the iSCSI Initiator, TCP/IP must be properly configured and enabled. The initiator will only function with the TCP/IP stack provided by HP TCP/IP Services for OpenVMS. Only the basic TCP/IP core functionality needs to be configured. Note that particular attention should be paid to the system's hostname, which is a defining element in the iSCSI Initiator name (a unique name assigned to each host running the iSCSI Initiator software). TCP/IP must be running and the hostname must be set before the iSCSI Initiator is loaded.

Configuring VLANs

While not mandatory, if the initiator will be operating on a shared network (a network not dedicated solely to storage), it is suggested that storage traffic be isolated to a dedicated Virtual LAN (VLAN). The VLAN will logically isolate storage traffic into its own subnet.

In order to configure and use a VLAN, the hosts, network switches, and targets must all support IEEE 802.1Q. For information on configuring VLANs on the OpenVMS hosts, see the *HP OpenVMS Version 8.3 New Features and Documentation Overview* and the *HP OpenVMS System Management Utilities Reference Manual*. For information on configuring VLANs on the network switches, see your switch manufacturer's documentation. VLAN configuration on the mpx100/100b targets will be performed during their installation and configuration (see section Installation and maintenance, page 57.)

Enabling Ethernet jumbo frames

If Ethernet jumbo frames are to be used for iSCSI traffic, they must be enabled on the initiators (OpenVMS hosts), network switches, and targets. To enable jumbo frames system-wide on an OpenVMS host node using the LAN_FLAGS system parameter, see the *HP OpenVMS System Management Utilities Reference Manual*. To enable jumbo frames on a per-device basis, see the *HP OpenVMS System Manager's Manual*.

Configuring target discovery

The OpenVMS Software-Based iSCSI Initiator supports two target discovery mechanisms – manual and iSNS. At least one of these methods must be configured on each iSCSI-enabled OpenVMS host:

- **Manual target discovery**

  With manual target discovery, the initiator is supplied with a list of IP addresses for each iSCSI target port. Each mpx100 has two iSCSI target ports. (The management port is not an iSCSI target port.) An initiator using this discovery method will periodically poll each target port in its manual discovery list to gather a list of accessible storage devices.

  1. To create a manual target list, copy the file

     ```
     SYS$COMMON:[SYSMGR]ISCSI$MANUAL_TARGETS.TEMPLATE
     ```

     to

     ```
     SYS$COMMON:[SYSMGR]ISCSI$MANUAL_TARGETS.DAT
     ```

     The directory SYS$SPECIFIC:[SYSMGR] can be used if the file is to be node-specific rather than cluster-wide.

2. Edit the new file and add a list of the IP names or addresses of the iSCSI target ports that should be probed for available storage devices. The header included in this file defines the proper format for these addresses. The manual target list is automatically loaded when the iSCSI Initiator is started. By default, changes to this file will not take effect until the system is rebooted or until the initiator is stopped and restarted.
3. To manually force the initiator to recognize additions to the manual target list while the initiator is running, issue the following command:

   ```
   $ mcr iscsi$control_program manual
   ```

   Target ports that have been added to this file since the initiator was started will be added to the list of target ports that are periodically scanned by the initiator. Note that target ports that have been removed from this file will not be removed from the initiator's scan list until the system is rebooted or the initiator is stopped and restarted.

NOTE:

Regardless of whether IP addresses or IP names are used in the manual target data file, every iSCSI target port must be known to TCP/IP. The command TCPIP SHOW HOST can be used to determine if the target port is known to TCP/IP. The host can be added to the local TCP/IP host database with the command TCPIP SET HOST. A target port not known to TCP/IP will not be probed by the iSCSI Initiator.

NOTE:

The default TCP/IP port used for iSCSI traffic is 3260. If a non-default port is to be utilized, the addresses listed in the manual targets file must include the port number. The header included in this file defines the format that must be used when including a port number. There is no need to include the port number if the default will be used. Additionally, if a non-default port number is to be utilized, the iSCSI ports on the mpx100 must be configured with that non-default port number.

NOTE:

The OpenVMS Software-Based iSCSI Initiator does not currently support IPv6. All IP addresses must be IPv4.

- **iSNS target discovery**

  The Internet Storage Name Service (iSNS) protocol provides a target discovery mechanism similar to the discovery services found in Fibre Channel. Among the capabilities provided by iSNS is the ability for storage targets to register with an iSNS server. Acting as iSNS clients, initiators are able to query this server to retrieve a lost of potential targets. The initiator can then use this list to query the individual targets to find its storage devices.

  The use of iSNS requires the availability of an iSNS server that is network accessible by both the storage targets and the initiators (OpenVMS hosts). Currently, the Microsoft iSNS Server is the only iSNS server supported for use with the OpenVMS Software-Based iSCSI Initiator.

  To use iSNS target discovery, both the initiators and targets must be properly configured with the IP address of the iSNS server.

1. To configure the OpenVMS initiators for iSNS, copy the file

   ```
   SYS$COMMON: [SYSMGR] ISCSI$ISNS_SERVICES.TEMPLATE
   ```

   to

   ```
   SYS$COMMON: [SYSMGR] ISCSI$ISNS_SERVICES.DAT
   ```

   The directory SYS$SPECIFIC:[SYSMGR] can be used if the file is to be node-specific rather than cluster-wide.
2. Edit the new file and add a list of the IP names or addresses of the iSNS servers that should be probed for available targets.

   The header in this file defines the proper format for these addresses. The iSNS server list is automatically loaded when the iSCSI Initiator is started. By default, changes to this file do not take effect until the system is rebooted or until the initiator is stopped and restarted.
3. To manually force the initiator to recognize additions to the iSNS server list while the initiator is running, issue the following command:

   ```
   $ mcr iscsi$control_program isns
   ```

iSNS servers that have been added to this file since the initiator was started will be added to the list of servers that are periodically queried by the initiator. Not that servers that have been removed from this file will not be removed from the initiator's scan list until the system is rebooted or the initiator is stopped and restarted.

NOTE:

Regardless whether IP addresses or IP names are used in the iSNS server data file, every iSNS server listed must be known to TCP/IP. Use the command `TCPIP SHOW HOST` to determine if the server is known to TCP/IP. Use the command `TCPIP SET HOST` to add the server to the local TCP/IP host database. A server not known to TCP/IP will not be queried by the iSCSI Initiator.

NOTE:

The default TCP/IP port used for iSNS traffic is 3205. This port number cannot be configured.

NOTE:

The OpenVMS Software-Based iSCSI Initiator does not currently support IPv6. All IP addresses must be IPv4.

Starting the iSCSI Initiator

Starting the iSCSI Initiator

After configuring the hosts and targets, the OpenVMS Software-Based iSCSI Initiator can be started by executing the DCL command procedure `SYS$STARTUP:ISCSI$INITIATOR_STARTUP.COM`. To start the iSCSI Initiator each time the host is booted, add the following line to `SYS$MANAGER:SYSTARTUP_VMS.COM`:

```
$ @SYS$STARTUP:ISCSI$INITIATOR_STARTUP.COM
```

NOTE:

Note that TCP/IP must be fully loaded before the iSCSI Initiator is started.

Stopping the iSCSI Initiator

Generally, there should be no need to stop the iSCSI Initiator after it has been loaded. However, should the need arise to stop the initiator, execute the DCL command procedure `SYS$STARTUP:ISCSI$INITIATOR_SHUTDOWN.COM`.

NOTE:

Note that if TCP/IP is stopped on a system running the iSCSI Initiator, the initiator will be automatically stopped and unloaded as part of the rundown of TCP/IP. After restarting TCP/IP, the iSCSI Initiator must be manually restarted.

NOTE:

HP strongly recommends that traffic to all iSCSI target storage devices be quieted prior to shutting down the initiator.

Setting up storage for OpenVMS

To set up storage for OpenVMS:

1. Set up LUNs using HP Command View EVA.

   See "Using HP Command View EVA to configure LUNs to iSCSI initiators" on page 127.

2. Discover and configure the iSCSI drives on the OpenVMS host using the following command:

   ```
   $ mcr sysman io auto/log
   ```

NOTE:

This step is required only if the LUNs are configured via HP Command View EVA *after* the initiator has been loaded. The command procedure used to load the initiator issues this command by default.

6 Setting up the iSCSI Initiator for multipathing

This chapter contains the following topics:

- Overview, page 97
- Configuring multipath with Windows iSCSI initiator, page 102
- Configuring multipath with the VMware iSCSI initiator, page 113
- Configuring multipath with the Solaris 10 iSCSI initiator, page 116
- Configuring multipath with the OpenVMS iSCSI initiator, page 122
- Device Mapper Multipath Enablement Kit for HP StorageWorks Disk Arrays, page 125

Overview

The mpx100/100b supports iSCSI multipath in a single or dual mpx100/100b configuration with a single EVA storage system.

As with single-path mpx100/100b configurations, presenting EVA LUNs to an iSCSI Initiator is a two-step process. First the EVA LUN must be presented to the mpx100/100b, and then it must be presented from the mpx100/100b to the iSCSI Initiator.

Because the mpx100/100b is bridging SCSI commands and data from the host to storage with iSCSI and Fibre Channel, it is important to understand what multipathing means from each technology's perspective.

NOTE:

The examples in this section show direct connect configurations between the EVA and the mpx100/100b. Note, however, that iSCSI multipath is also supported in fabric connections.

IMPORTANT:

Windows XP Professional is not supported by Microsoft's Multipath I/O (MPIO).

Understanding Fibre Channel multipathing for the mpx100/100b

EVA storage array perspective

The mpx100/100b has two FC ports, each having a unique WWPN. When connected to the EVA storage system, these WWPNs behave like any other WWPN accessing the array. When the iSCSI host entry is created in HP Command View, all FC port WWPNs are included in the iSCSI host properties.

The mpx100/100b FC ports do not necessarily have to be connected to the EVA storage controller to be added to the iSCSI host entry. Upon iSCSI device discovery, HP Command View polls the mpx100/100b for both FC port WWPNs and adds them to the iSCSI host entry FC port list.

If a single mpx100/100b is discovered as an iSCSI controller (see Figure 43), both of its FC ports will be included in the single HP Command View iSCSI host entry. If two mpx100's/100b's are discovered (see Figure 44), the single HP Command View EVA iSCSI host entry contains four FC ports—two from each mpx100/100b.

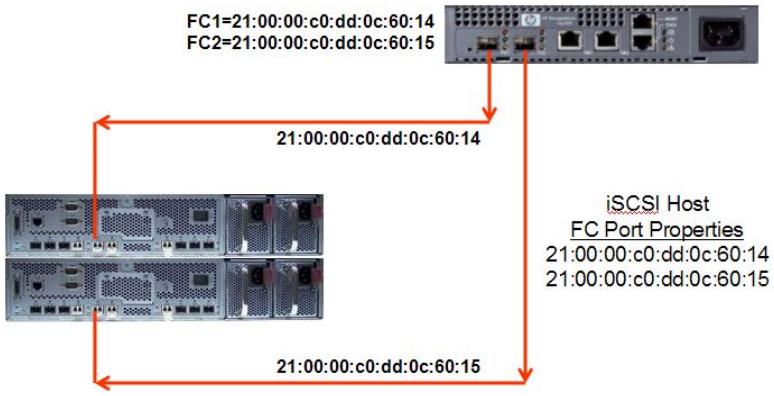


Figure 43 Example: Single mpx100 multipath—WWPN configuration

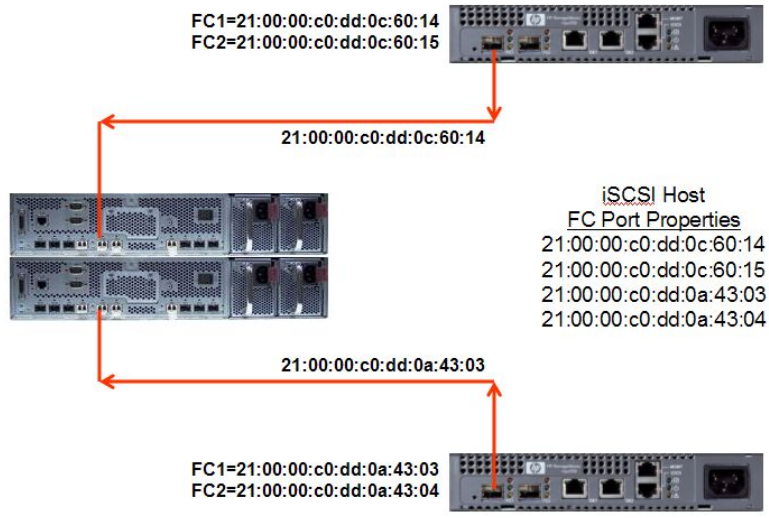


Figure 44 Example: Dual mpx100 multipath—WWPN configuration

The mpx100/100b perspective

When an EVA storage system FC port connects to the mpx100/100b, the mpx100/100b creates in its database a unique iSCSI target name that includes the WWPN of the EVA storage controller port. This iSCSI target name is used by the iSCSI Initiator to connect to the EVA storage system.

Each EVA FC port must be connected to the mpx100/100b in order for the mpx100/100b to create an iSCSI target entry (see Figure 45).

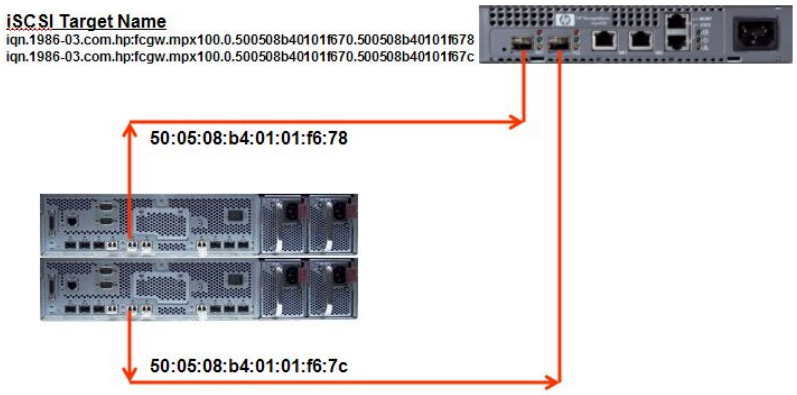


Figure 45 Example: Single mpx100 multipath—iSCSI target configuration

As with any other Fibre Channel host entry within HP Command View EVA, when a LUN is presented to the iSCSI host entry the LUN is presented to all mpx100/100b FC port WWPNs contained in that entry (see Figure 46).

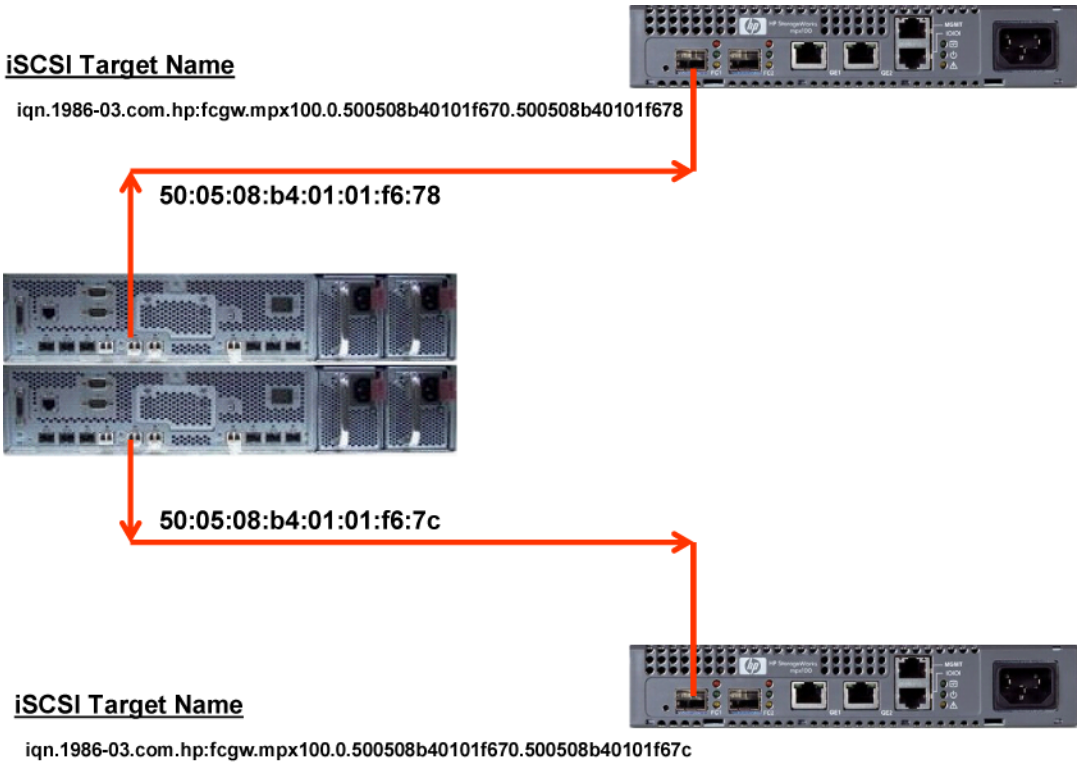


Figure 46 Example: Dual mpx100 multipath — iSCSI target configuration

Understanding iSCSI multipathing with the mpx100/100b

Once the EVA target and LUNs are presented to the mpx100/100b FC port WWPNs, they can be presented to iSCSI Initiators through the mpx100/100b iSCSI GbE ports.

Although each Fibre Channel target and its LUNs are received by the mpx100/100b through separate FC ports, all targets are presented from each iSCSI port of the mpx100/100b to the IP network (see Figure 47).

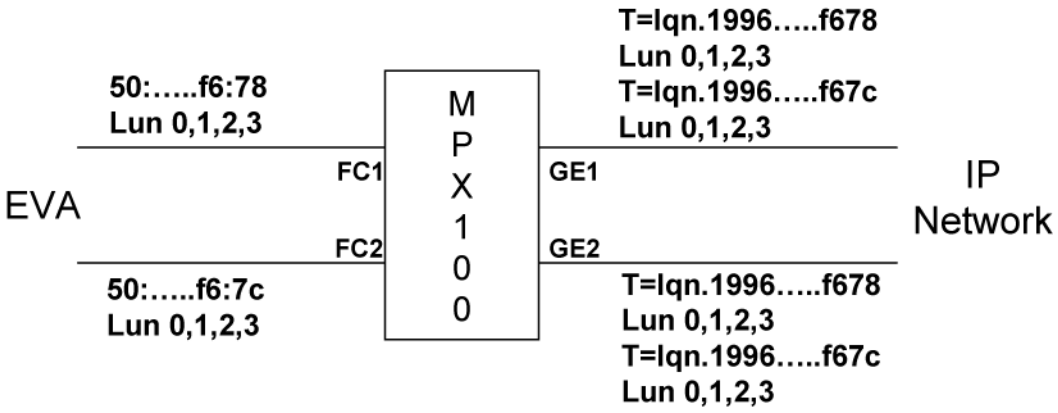


Figure 47 Example: Fibre Channel to IP port/target translation

The iSCSI Initiator discovers the targets presented out of the mpx100/100b GE ports by discovering the GE port's IP addresses and logging in to the target (see Figure 48).

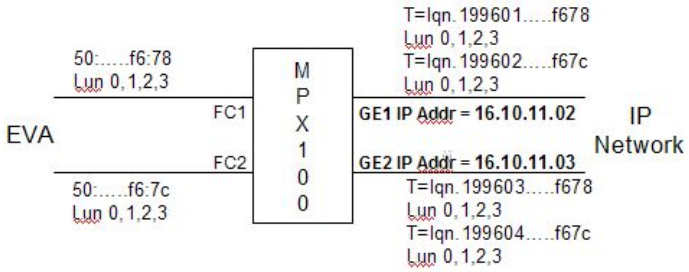


Figure 48 Example: Single mpx100 iSCSI port IP addressing

Each iSCSI GbE port has duplicate paths to the LUN because each GE port is presenting two unique targets with the same LUN information. Each unique target should be considered an iSCSI path to the LUN.

iSCSI Initiator perspective

Because of the mpx100's/100b's ability to present multiple Fibre Channel targets through one physical iSCSI GbE connection, it is possible for the iSCSI Initiator to connect—and use—more virtual paths than are physically available on the FC/IP networks.

NOTE:

Using the iSCSI target discovery process, it is up to the iSCSI Initiator to determine how many targets to log in to, bearing in mind that one target equals one path.

For the preceding examples, Table 16 shows all the paths available to an iSCSI Initiator connected to both iSCSI GbE Ports of the mpx100/100b.

Table 16 Single mpx100/100b multipath configuration

iSCSI Initiator—virtual path	mpx100/100b iSCSI GbE port—physical path	EVA FC port—physical path
iqn.199601…..f678	16.10.11.02	50:05:08:b4:01:01:f6:78

iSCSI Initiator—virtual path	mpx100/100b iSCSI GbE port—physical path	EVA FC port—physical path
iqn.199602.....f67c		
iqn.199603.....f678	16.10.11.03	50:05:08:b4:01:01:f6:7c
iqn.199604.....f67c		

Adding another mpx100/100b and two more EVA ports to this configuration results in the configuration in Figure 49 and Table 17:

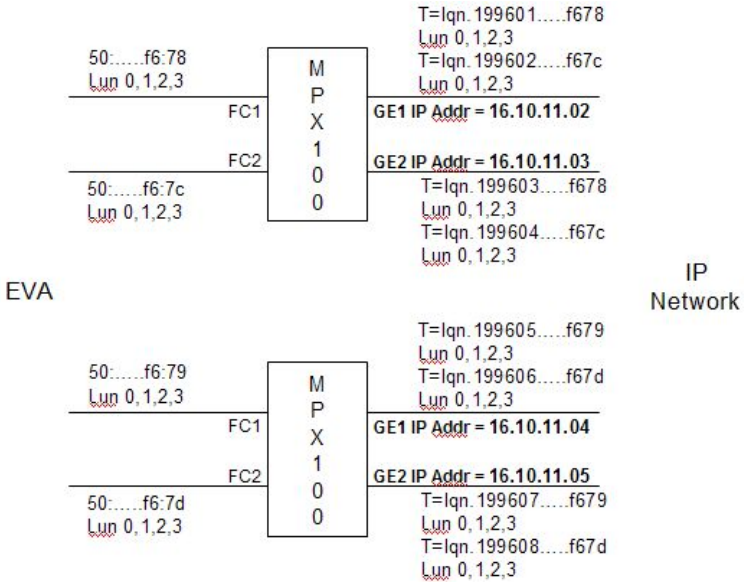


Figure 49 Example: Dual mpx100 iSCSI port IP addressing

Table 17 provides an example of a dual multipath configuration.

Table 17 Example: Dual mpx100/100b multipath configuration

iSCSI Initiator—virtual path	mpx100/100b iSCSI GbE port—physical path	EVA FC port—physical path
iqn.199601.....f678	16.10.11.02	50:05:08:b4:01:01:f6:78
iqn.199602.....f67c		
iqn.199603.....f678	16.10.11.03	50:05:08:b4:01:01:f6:7c
iqn.199604.....f67c		
iqn.199605.....f679	16.10.11.04	50:05:08:b4:01:01:f6:79
iqn.199606.....f67d		
iqn.199607.....f679	16.10.11.05	50:05:08:b4:01:01:f6:7d
iqn.199607.....f67d		

The iSCSI Initiator may use all virtual paths as if they were physical paths following the rules/restrictions of the iSCSI multipath software residing on the iSCSI Initiator.

The iSCSI Initiator host can have single or multiple physical connections or links to the IP storage network.

With a single physical connection, the iSCSI virtual paths can share the same link, because IP packets with their TCP/iSCSI payloads are routed via the IP packet network addressing information.

With multiple physical connections, the MS iSCSI Initiator control panel applet allows setting a specific link to be used as the primary iSCSI session during target login. However, the remaining links are considered to be standby and will only be used if the primary link becomes unavailable.

This becomes an implicit hardware failover capability, because the initiator's routing table contains all available links to the target. If the session's link becomes unavailable, the iSCSI session ends. TCP tries another link in the routing table to renegotiate or connect to the mpx100/100b GbE port; the iSCSI Initiator and the target performs their login sequence, and I/O resumes.

Configuring multipath with Windows iSCSI Initiator

Since V2.0 the Microsoft iSCSI Initiator includes support for establishing redundant paths for sending I/O from the initiator to the target. Setting up redundant paths properly is important to ensure high availability of the target disk. Ideally, the PC would have the paths use separate NIC cards and separate network infrastructure (cables, switches, mpx100's/100b's). Separate target ports are recommended, but are not necessary.

Microsoft MPIO support allows the initiator to log in to multiple sessions to the same target and aggregate the duplicate devices into a single device exposed to Windows. Each session to the target can be established using different NICs, network infrastructure, and target ports. If one session fails, another session can continue processing I/O without interruption to the application. The iSCSI target must support multiple sessions to the same target. The Microsoft iSCSI MPIO DSM supports a set of load balance policies that determine how I/O is allocated among the different sessions. With Microsoft MPIO, the load balance policies apply to each LUN individually.

The Microsoft iSCSI DSM assumes that all targets are active/active and can handle I/O on any path at any time. There is no mechanism within the iSCSI protocol to determine whether a target is active/active or active/passive; therefore, the mpx100/100b supports only multipath configurations with the EVA XL and the EVA GL with active/active support.

Microsoft MPIO multipathing support for iSCSI

Installing the MPIO feature for Windows Server 2008

NOTE:

Microsoft Windows 2008 includes a separate MPIO feature that requires installation for use. Microsoft Windows Server 2008 also includes the iSCSI Initiator. Download or installation is not required.

To install the MPIO feature for Windows Server 2008:

1. Check the box for Multipath I/O in the Add Features page (Figure 50).
2. Click **Next** and then click **Install**.

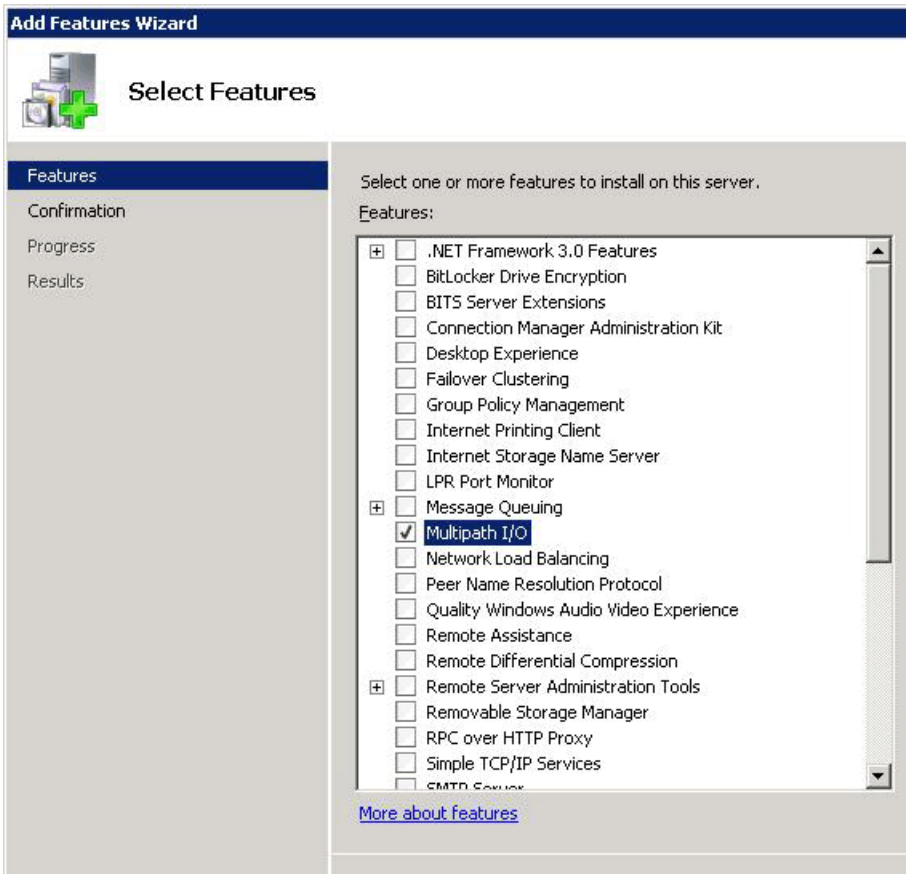


Figure 50 Add Features page

After the server reboots, add support for iSCSI Devices using the MPIO applet (see Figure 51).

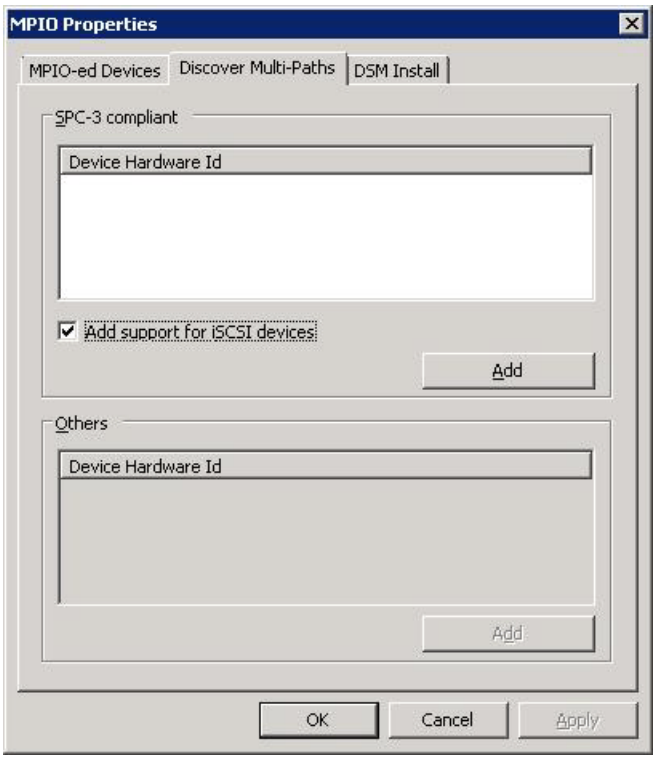


Figure 51 MPIO Properties page

Installing the MPIO feature for Windows Server 2003

For Windows Server 2003, if you are installing the initiator for the first time, check all the installation option checkboxes and then click **Next** to continue (Figure 52).

To add or remove specific MS iSCSI software Initiator components after the initial install, run the setup package executable and select the check box to add MPIO. The application automatically checks the boxes for components that are already installed. For example, if you want to add the MS MPIO component, leave the other check boxes unchecked; check only the MS MPIO check box.

NOTE:

The installation requires a reboot.

IMPORTANT:

Windows XP Professional is not supported by Microsoft's MPIO.

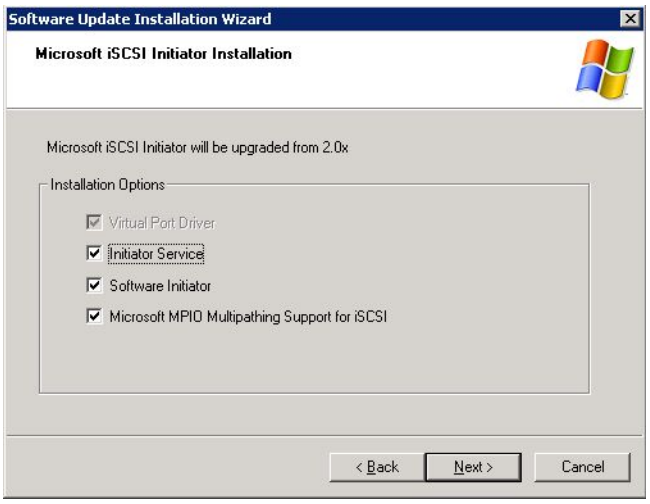


Figure 52 Software update installation wizard

Start the iSCSI Initiator from the **Start > All Programs** menu. At the Discovery tab, add the mpx100/100b iSCSI port IP addresses that will serve storage to this server. Note that depending on the Fibre Channel and IP connections to and from the mpx100/100b and to the iSCSI Initiator, the mpx100/100b iSCSI port may have more than one target (see Figure 53). Click **Next** to display the Targets tab.

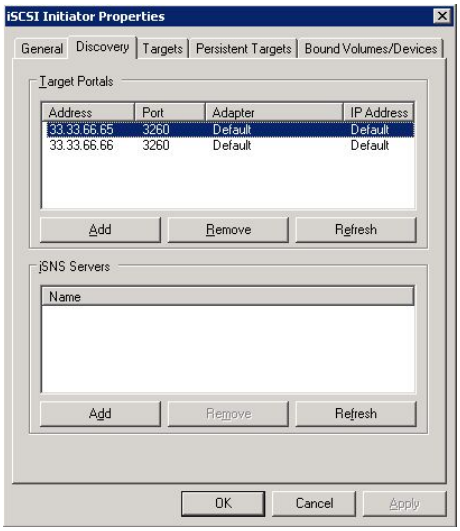


Figure 53 Properties screen for iSCSI Initiator

The Targets tab (Figure 53) displays all iSCSI targets presented by all discovered mpx100/100b iSCSI ports in the previous step. Double-click a target name to open the Log On to Target window, and select the **Automatically restore this connection when system boots** and **Enable multi-path** check boxes (see Figure 54).

The **Auto Restore** check box adds the target name under the Persistent Targets list.

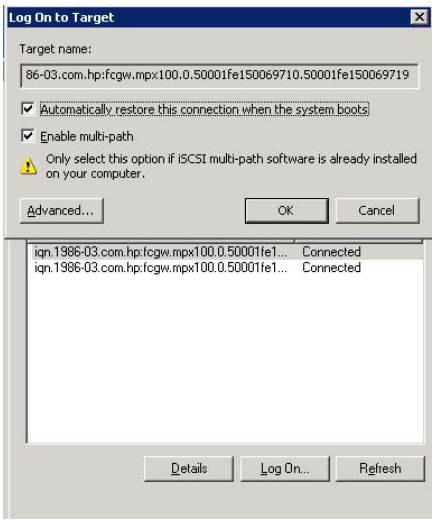


Figure 54 Log on to target

A status of Connected indicates the iSCSI Initiator is logged into the mpx100/100b and is ready to be presented with EVA LUNs from HP Command View EVA.

Setting up storage for multiple paths in Windows

To set up storage for multiple paths in Windows:

1. Set up LUNs using HP Command View.
   See Using HP Command View EVA to configure LUNs to iSCSI initiators, page 127.

NOTE:

For dual mpx100/100b multipath configurations—when the iSCSI Initiator is logged into both mpx100's/100b's, HP Command View EVA polls both mpx100's/100b's and recognizes duplicate entries as the same initiator and displays an initiator only once in its host list. When the Vdisk is presented, HP Command View EVA updates the initiator on both mpx100's and mpx100b's.

In order for HP Command View EVA to present a LUN to an iSCSI Initiator logged into both mpx100's/100b's, HP Command View EVA must be able to communicate with the management port of each mpx100/100b. If HP Command View EVA discovers a link down when trying to present the LUN, it displays the communication error and does not start the update.

Once the Vdisk is presented to the iSCSI Initiator, it is available to the server as block-level storage. In Disk Management, rescan the disks or reboot the server to access the iSCSI storage (see Figure 55).

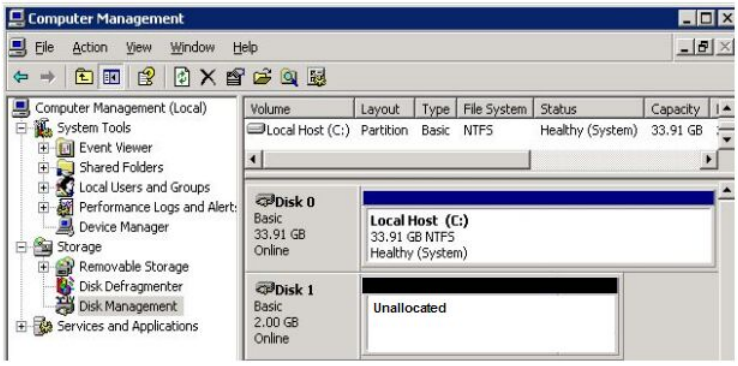


Figure 55 Computer management

NOTE:

After a rescan or reboot, the multipath information for the LUN can be found in the iSCSI UI. In addition, the system event log records iSCSI Initiator and path information.

2. For Microsoft MPIO, the load balance policies apply to each LUN individually. To display and modify the LUN load balance policy (see Figure 56):
   a. Start the MS iSCSI control panel applet.
   b. Select the **Target** tab.
   c. Click **Details**.
   d. Click **Devices**.
   e. Highlight a LUN device name and click **Advanced**.
   f. Select the **MPIO** check box.
   g. Select the desired options on the **Load Balance Policy** menu to set the policy.

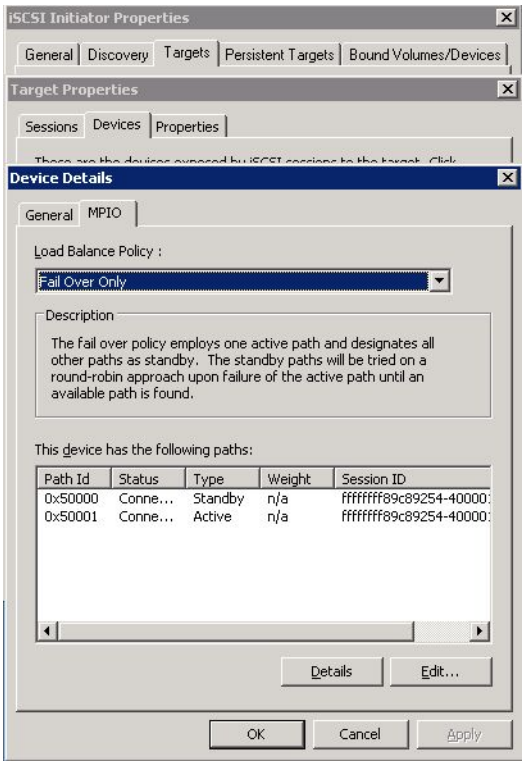


Figure 56 iSCSI Initiator properties

Load balancing features of Microsoft MPIO for iSCSI

The features of MS MPIO for iSCSI include:

- **Failover Only**—No load balancing is performed. There is a single active path and the rest of the paths are standby paths. The active path is used for sending all I/O. If the active path fails, then one of the standby paths is used. When the formally active path is reconnected, it becomes active and the activated standby path returns to standby.
- **Round Robin**—All paths are active paths; they are used for sending I/O in a round robin fashion.
- **Round Robin with a subset of paths**—A set of paths is configured as active and a set of paths is configured as standby. I/O is sent in a round robin fashion over the active paths. If all of the active paths fail, one of the standby paths is used. If any of the formerly active paths become available again, then the formerly active paths are used. The activated standby path becomes a standby path again.
- **Weighted Path**—Each path is assigned a weight and I/O is sent on the path with the lowest weight. If the path with the lowest weight fails, then the path with the next lowest weight is used.
- **Least Queue Depth**—This is not supported by MPIO.

NOTE:

For raw disk access, MPIO load balance policy must be set to "Failover Only." For file system disk access, all MPIO load balance policies are supported.

Failover policies are set on a LUN-by-LUN basis. MPIO support does not have global initiator for failover settings.

Microsoft MPIO with QLogic iSCSI HBA

The QLogic iSCSI HBA is supported in a multipath Windows configuration that is used in conjunction with Microsoft iSCSI Initiator Services and Microsoft MPIO. Because the iSCSI driver resides onboard the QLogic iSCSI HBA it is not necessary to install the Microsoft iSCSI Initiator.

Installing the QLogic iSCSI HBA

Install the QLogic iSCSI HBA hardware and software following the instructions in the QLogic installation manual. The QLogic iSCSI HBA is managed by QLogic's SANsurfer Management Suite (SMS).

NOTE:

Once the QLogic iSCSI HBA is installed, the configuration settings for the QLogic iSCSI Initiator must now be set through SMS. The QLogic iSCSI HBA will not appear in Microsoft's Network Connection device list.

Installing the Microsoft iSCSI Initiator services and MPIO

To install the Microsoft iSCSI Initiator:

1. Access the Microsoft iSCSI Initiation Installation page of the Software Update Installation Wizard (Figure 57)
2. Reboot your system.

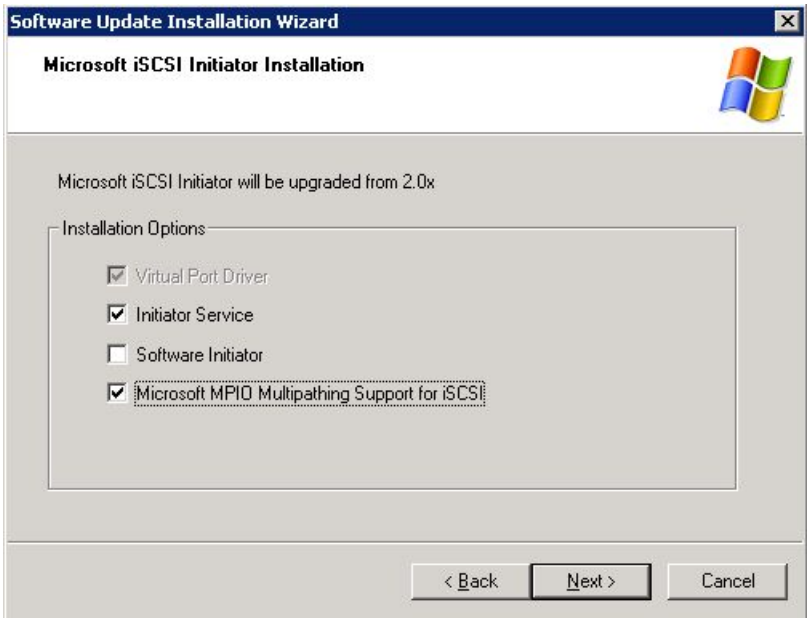


Figure 57 Microsoft iSCSI Initiator services screen

IMPORTANT:

Do not check **Software Initiator**. Doing so will install the Microsoft Initiator.

Configuring the Qlogic iSCSI HBA

To configure the QLogic iSCSI HBA:

1. Start QLogic SMS either from the desktop icon or through Start/Programs and connect to localhost (see Figure 58).
2. Click **Yes** to start the general configuration wizard (see Figure 59). Use the Wizard to:
   - Choose iSCSI HBA port to configure the QLogic iSCSI HBA
   - Configure HBA Port network settings
   - Configure HBA Port DNS settings (optional)
   - Configure SLP Target Discovery settings (optional)
   - Configure iSNS Target Discovery settings (optional)

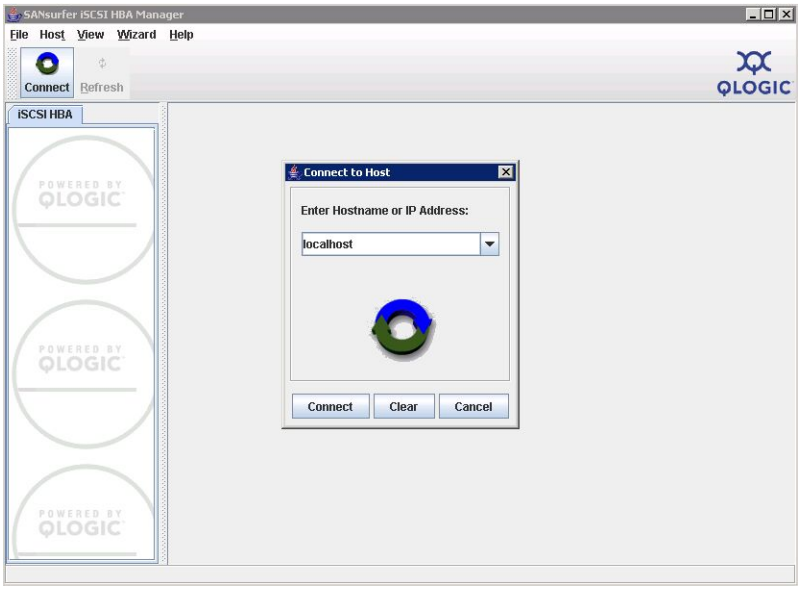


Figure 58 Connect to host screen

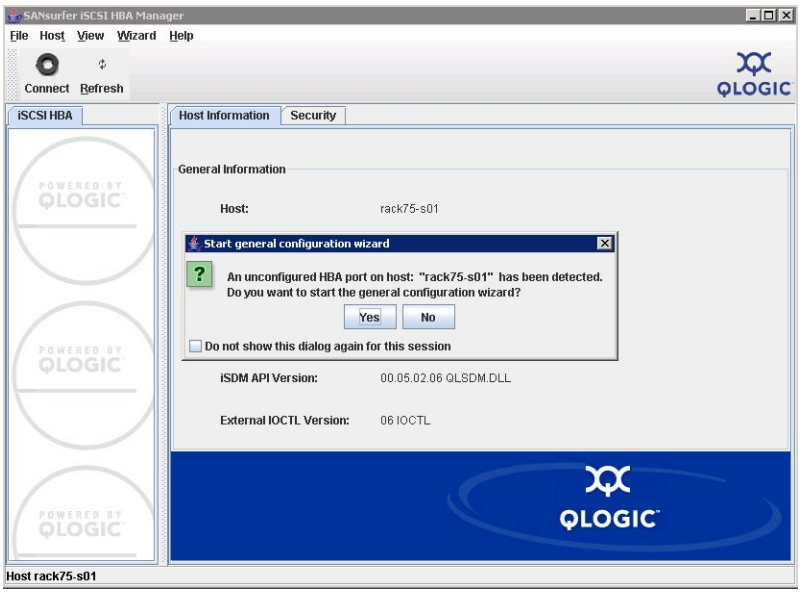

SANsurfer iSCSI HBA Manager
File Host View Wizard Help
Connect Refresh
QLOGIC
iSCSI HBA
Host Information Security
General Information
Host: rack75-s01
Start general configuration wizard
An unconfigured HBA port on host: "rack75-s01" has been detected.
Do you want to start the general configuration wizard?
Yes No
Do not show this dialog again for this session
iSDM API Version: 00.05.02.06 QLSDM.DLL
External IOCTL Version: 06 IOCTL
QLOGIC
Host rack75-s01

Figure 59 Start general configuration window

Adding Targets to QLogic iSCSI Initiator

To add the HBA Port iSCSI targets:

1. Click the green plus sign (see Figure 60).
2. Enter the first mpx100/100b iSCSI target port IP address.

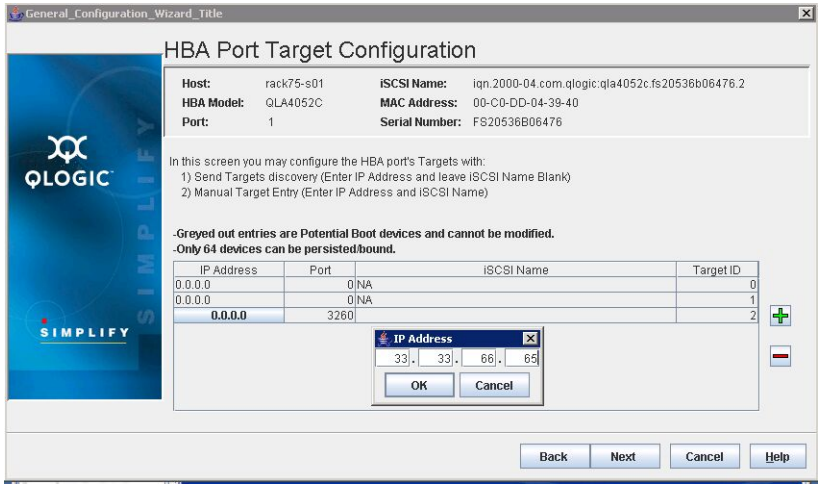

General_Configuration_Wizard_Title
HBA Port Target Configuration
Host: rack75-s01
HBA Model: QLA4052C
Port: 1
iSCSI Name: iqn.2000-04.com.qlogic:qla4052c.fs20536b06476.2
MAC Address: 00-C0-DD-04-39-40
Serial Number: FS20536B06476
In this screen you may configure the HBA port's Targets with:
1) Send Targets discovery (Enter IP Address and leave iSCSI Name Blank)
2) Manual Target Entry (Enter IP Address and iSCSI Name)
-Greyed out entries are Potential Boot devices and cannot be modified.
-Only 64 devices can be persisted/bound.
IP Address Port iSCSI Name Target ID
0.0.0.0 0 NA 0
0.0.0.0 0 NA 1
0.0.0.0 3260 2
IP Address
33 . 33 . 66 . 65
OK Cancel
Back Next Cancel Help

Figure 60 HBA port target configuration

3. Repeat Step 1 and Step 2 for each additional mpx you want to add.
4. Click **Next**.
5. To enable the changes, enter the SMS password: `config`.

6. Select the **Target Settings** tab. Verify that the HBA state is Ready, Link Up and each target entry's state is Session Active (Figure 61).

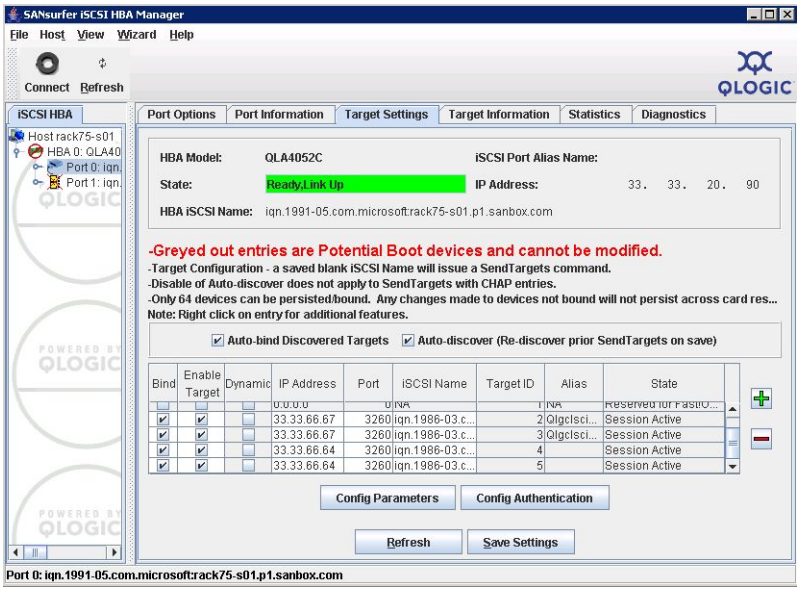


Figure 61 Target settings tab

Presenting LUNs to the QLogic iSCSI Initiator

To present LUNs to the QLogic iSCSI Initiator:

1. Follow procedures in "Creating an iSCSI initiator host via HP Command View EVA" on page 128 to:
   - Create an iSCSI host entry, and
   - Present LUNs to the iSCSI host
2. On the iSCSI HBA tab (Figure 62) verify that the QLogic iSCSI HBA is connected to the iSCSI LUNs in SMS under the HBA iSCSI port.

Figure 62 HBA iSCSI port connections

3. Use Microsoft's iSCSI services to manage the iSCSI target login and LUN load balancing policies (see Figure 63).

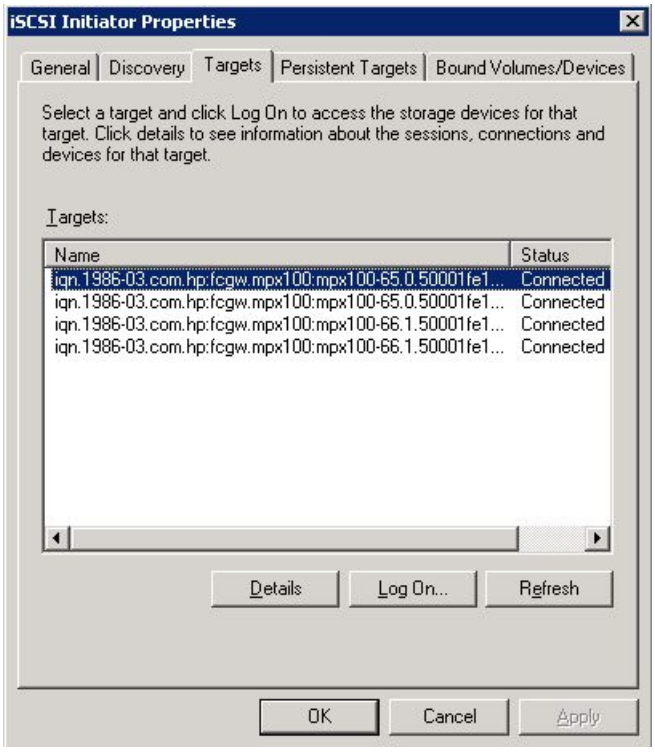


Figure 63 iSCSI Initiator properties — Targets tab

Configuring multipath with the VMware iSCSI Initiator

Native multipathing solution for iSCSI

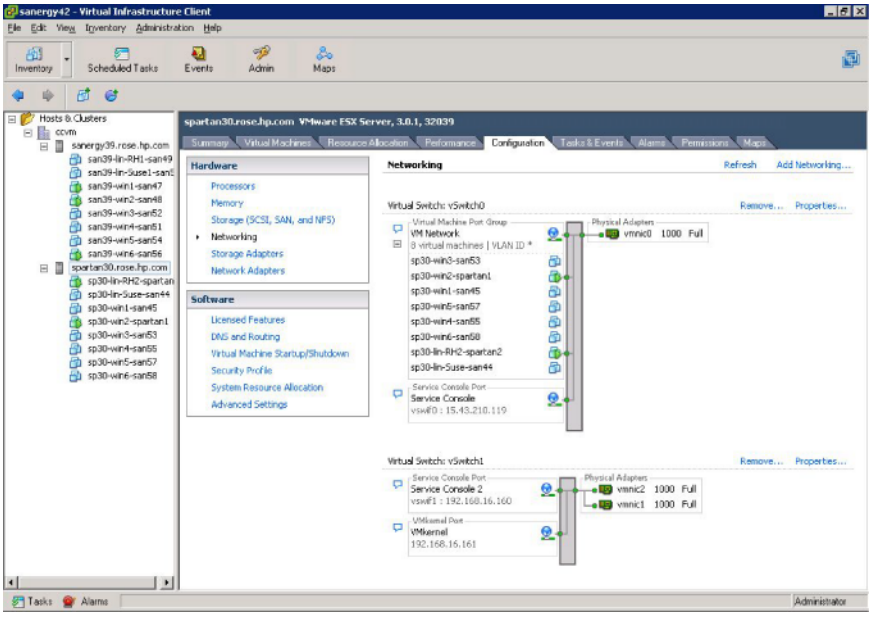
VMware supports a native multipathing solution for iSCSI. However, the software iSCSI Initiator can run only one instance of VMkernel, hence, it is impossible to bind two different IP addresses with one VMkernel. But VMware's support for NIC teaming solves the problem at the server level, avoiding a single NIC failure. Thus, the VMware's software iSCSI Initiator support for multipathing is provided via NIC teaming. The EVA iSCSI connectivity option supports one pair of mpx100/100b units per EVA. Hence it is possible to have two different physical routes to the same LUN from an ESX server.

Setting up multipath configurations

Multipath setup is similar to single path setup shown in Chapter 4, except for the following steps:

1. Configure the VMkernel TCP/IP networking stack for iSCSI support.

2. Configure the VMkernel, Service console with a dedicated virtual switch and two dedicated NICs in Teaming for iSCSI data traffic. Follow the instructions from VMware to set up NIC teaming.



3. When configuring the iSCSI software Initiator, set up the Discovery Address:
   a. Open the iSCSI Initiator Properties dialog box, see iSCSI initiator setup for VmWare, page 89
   b. Click the **Dynamic Discovery** tab.
   c. Click **Add** to add a new iSCSI target. The **Add Send Target Server** dialog box is displayed.
   d. Enter the first mpx100/100b iSCSI IP address.
   e. Click **OK**.
   f. Repeat steps **a** through **e** above to add the second mpx100/100b IP address.
4. Present the LUNs to initiators via HP Command View, selecting the host mode, **Linux/MacOS**.
5. Rescan the volumes to identify the new LUNs in VMware server.
6. Present the iSCSI storage for Guest OS Virtual Machine. Use the same procedure that is used for a single path setup ("iSCSI initiator setup for VmWare" on page 89).

Managing multipathing

VMware defines the path states as:

- Active—The path is working and currently used for all data transfers.
- Disabled—The path is disabled and no data can be transferred.
- Standby—The path is working but not currently used for transferring data.
- Dead—The initiator cannot connect to the storage via this path.

VMware LUN multipathing policies

Multipathing policies supported by VMware include:

- Fixed—The ESX server always uses the preferred path when that path is available. If it cannot access the LUN through the preferred path, then it fails over to alternate path. Fixed is the default policy for Active/Active arrays. Fixed is the default policy.

- Most Recently Used—ESX server uses the most recent path to the disk until this path becomes unavailable. Even if the path becomes available, the host does not automatically revert back to the preferred path.
- Round Robin (Experimental)—The ESX Server load balances across all available paths. VMware defines the Round Robin policy as *Experimental*; Round Robin, therefore, is *not* a supported multipathing policy.

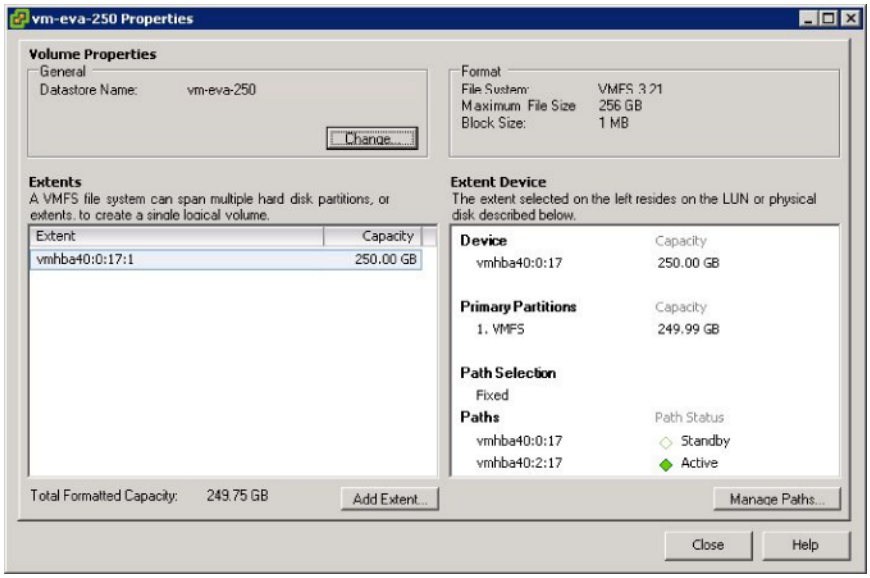
NOTE:

HP recommends using Fixed (default) for EVA iSCSI connectivity.

Viewing and changing multipathing

To view and/or change datastore volume properties:

1. From the VMware VI client, select the server, and then click the **Configuration** tab.
2. Under Hardware, click **Storage (SCSI, SAN and NFS)** , and then select **Datastore Volume**.
3. Click the **Properties** link to access the Volume Properties dialog box.
4. Click **Manage Path** and then click **OK** to view and modify the virtual Machine properties.

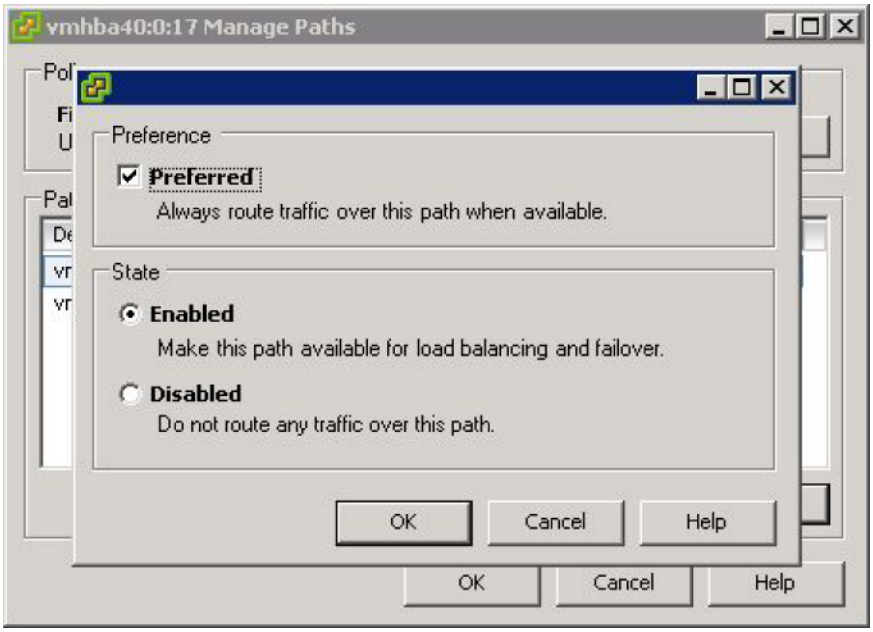


Viewing raw mapped LUNs properties

To view raw mapped LUNs properties:

1. From the VMware VI client, select the **Virtual Machine** from the inventory panel.
2. From the Summary tab, click the **Edit Settings** link.
3. On the Hardware tab, select the hard disk whose properties you want to remap.

4. Click **Manage Paths** to view and modify your selections.



5. Click **OK**.

Important information about multi-initiators and VMFS clusters

In a multipath environment, configure two ESX servers to view the same LUN. When presenting a LUN from HP Command View EVA, present the LUN to both initiators:

- From one initiator, create a VMFS file system and mount it. By default this files system is in PUBLIC mode.
- The second host also accesses the same file system created on the shared LUN.

IMPORTANT:

Multi-initiators can access the same LUN in single path as well. Accessing the same LUN is not restricted to multipathing.

Configuring multipath with the Solaris 10 iSCSI Initiator

This section contains information about configuring multipath with the Solaris 10 iSCSI Initiator.

MPxIO overview

The Sun multipathing software (MPxIO) provides basic failover and load-balancing capability to HP StorageWorks EVA4x00/6x00/8x00 storage systems. MPxIO allows the merging of multiple SCSI layer paths, such as an iSCSI device exposing the same LUN via two different iSCSI target names. Because MPxIO is independent of transport, it can multipath a target that is visible on both iSCSI and FC ports. This section describes only the iSCSI implementation of MPxIO with the mpx100/100b.

NOTE:

MPxIO is not supported on versions of the EVA3000/5000.

For more information about MPxIO, see the *Solaris Fibre Channel and Storage Multipathing Administration Guide* at: http://docs.sun.com/source/819-0139

Preparing the host system

To verify that MPxIO is enabled:

1. Issue the following command to verify that the MPIO setting is no:

   ```
   /kernel/drv/iscsi.conf file to verify mpxio-disable="no"
   ```

2. If setting is `yes` change to `no`, and reboot:

   ```
   Reboot -- -r
   ```

Example (enabling and disabling MPxIO on all iSCSI ports): `/kernel/dev/iscsi.conf settings`

```
# Copyright 2006 Sun Microsystems, Inc. All rights reserved.
# Use is subject to license terms.
#
#ident "@(#)iscsi.conf 1.2 06/06/12 SMI"
name="iscsi" parent="/" instance=0;
ddi-forceattach=1;
#
# I/O multipathing feature (MPxIO) can be enabled or disabled using
# mpxio-disable property. Setting mpxio-disable="no" will activate
# I/O multipathing; setting mpxio-disable="yes" disables the feature.
#
# Global mpxio-disable property:
#
# To globally enable MPxIO on all iscsi ports set:
# mpxio-disable="no";
#
# To globally disable MPxIO on all iscsi ports set:
# mpxio-disable="yes";
#
mpxio-disable="no";
#
```

Setting configuration settings

To configure iSCSI target settings:

1. Use the `iscsiadm` command to add the mpx100/100b iSCSI port IP addresses:

   ```
   iscsiadm add discovery-address 33.33.66.65
   ```

NOTE:

The iSCSI Initiator must discover all targets presented by each mpx100/100b iSCSI port used in a multipath configuration.

2. Create a Solaris iSCSI host entry to present LUNs to an iSCSI host using HP Command View EVA. Follow the procedure Creating an iSCSI initiator host via HP Command View EVA, page 128. (Note that the host mode setting for Solaris is Linux/MAC.
3. Enable the SendTargetsdiscovery method:

   ```
   # iscsiadm modify discovery --sendtargets enable
   ```

4. Create the iSCSI device links for the local system:

   ```
   # devfsadm -i iscsi
   ```

Verifying configuration settings

To verify the configuration settings, display the LUNs configured to each path by executing `iscsiadm list target -S`:

NOTE:

The following example shows four paths (ports) visible from the array on the host and two LUNs configured on the array for the host.

For example:

```
# iscsiadm list target –S
Target: iqn.1986-03.com.hp:fcgw.mpx100:mpx100-66.0.
50001fe150002f70.50001fe150002f78
Alias: QlgcIsciTgtNode
TPGT: 0
ISID: 4000002a0000
Connections: 1
LUN: 3
Vendor: HP
Product: HSV210
OS Device Name: /dev/rdsk/
c4t600508B4001072710000060000C540000d0s2
LUN: 4
Vendor: HP
Product: HSV210
OS Device Name: /dev/rdsk/
c4t600508B4001072710000060000C540000d0s2
Target: iqn.1986-03.com.hp:fcgw.mpx100:mpx100-66.0.
50001fe150002f70.50001fe150002f7a
Alias: QlgcIsciTgtNode
TPGT: 0
ISID: 4000002a0000
Connections: 1
LUN: 3
Vendor: HP
Product: HSV210
OS Device Name: /dev/rdsk/
c4t600508B4001072710000060000C540000d0s2
```

```
LUN: 4
Vendor: HP
Product: HSV210
OS Device Name: /dev/rdsk/
c4t600508B4001072710000060000C540000d0s2
Target: iqn.1986-03.com.hp:fcgw.mpx100:mpx100-65.1.
50001fe150002f70.50001fe150002f7e
Alias –
ISID: 4000002a0000
Connections: 1
LUN: 3
Vendor: HP
Product: HSV210
OS Device Name:
/dev/rdsk/c4t600508B4001072710000060000C540000d0s2
LUN: 4
Vendor: HP
Product: HSV210
OS Device Name:
/dev/rdsk/c4t600508B4001072710000060000C4A0000d0s2
Target: iqn.1986-03.com.hp:fcgw.mpx100:
mpx100-65.1.50001fe150002f70.50001fe150002f7f
Alias –
ISID: 4000002a0000
Connections: 1
LUN: 3
Vendor: HP
Product: HSV210
OS Device Name:
/dev/rdsk/c4t600508B4001072710000060000C540000d0s2
LUN: 4
Vendor: HP
Product: HSV210
OS Device Name:
/dev/rdsk/c4t600508B4001072710000060000C4A0000d0s2
#
```

Verifying that a single device is displayed for each LUN

To verify that a single device is displayed for each LUN (regardless of the number of paths connected), execute the `format` command:

```
# format

Searching for disks...done

0. c0t0d0<COMPAQ–BF00963643-3B05 cyl 5271 alt 2 hd 20 sec 168>

AVAILABLE DISK SELECTIONS:

/pci@1f,4000/scsi@3/sd@0,0

1. c4t600508B4001072710000060000C4A0000d0<HP–HSV210-5000 cyl 3198 alt 2
hd 128 sec 128>/scsi_vhci/ssd@g600508b4001072710000060000c4a0000
```

```
2. c4t600508B4001072710000600000C540000d0<HP—HSV210-5000 cyl 3198 alt 2
hd 128 sec 128>/scsi_vhci/ssd@g600508b400107271000060000c
```

Enabling MPxIO

To enable MPxIO for HP storage devices, the appropriate information for `device-type-scsioptions-list` must be added in the `/kernel/drv/scsi_vhci.conf` file.

To enable MPxIO for HP:

1. Use a text editor to change the configuration file. For example:

   ```
   # vi /kernel/drv/scsi_vhci.conf
   ```

2. Add the following lines to cover the 4x00/6x00/8x00 HP arrays:

NOTE:

You must enter six spaces after "HP," as shown.

```
device-type-scsi-options-list =
"HP HSV", "symmetric-option";
symmetric-option = 0x1000000;
```

3. To activate the changes, run a reconfiguration reboot:

   ```
   # reboot -- -r
   ```

Verifying the MPxIO configuration

To verify that MPxIO is enabled, execute the following commands:

- `mpathadm list lu`
- `mpathadm show lu`

IMPORTANT:

LUN 0 must not be presented to the iSCSI Initiator. Failure to do so may result in a system panic when the `mpathadm` command is invoked. See Set configuration settings, page 117, or the *EVA iSCSI Connectivity Option release notes* for the procedure to remove LUN 0 from the initiator.

Verifying the number of paths

To verify the number of paths, execute the `mpathadm list lu` command:

```
# mpathadm list lu
/dev/rdsk/c4t600508B4001072710000600000C4A0000d0s2
Total Path Count: 4
Operational Path Count: 4
/dev/rdsk/c4t600508B4001072710000600000C540000d0s2
```

```
Total Path Count: 4
Operational Path Count: 4
#
```

Verify mpath-support parameter and Target Portal Group

To verify that the `mpath-support` parameter Asymmetric is set to no and that all paths are in one Target Portal Group, execute the `mpathadm show lu` command:

```
# mpathadm show lu /dev/rdsk/c4t600508B4001072710000600000C4A0000d0s2
Logical Unit: /dev/rdsk/c4t600508B4001072710000600000C4A0000d0s2
mpath-support: libmpscsi_vhci.so
Vendor: HP
Product: HSV210
Revision: 5000
Name Type: unknown type
Name: 600508b4001072710000600000c4a0000
Current Load Balance: round-robin
Asymmetric: no
Logical Unit Group ID: NA
Auto Failback: on
Auto Probing: NA
Paths:
Initiator Port Name: iqn.1986-03.com.sun:sansun3,4000002a00ff
Target Port Name: 4000002a0000,iqn.1986-03.com.hp:fcgw.mpx100:mpx100-
66.0.50001fe150002f70.50001fe150002f78,0
Override Path: NA
Path State: OK
Disabled: no
Initiator Port Name: iqn.1986-03.com.sun:sansun3,4000002a00ff
Target Port Name: 4000002a0000,iqn.1986-03.com.hp:fcgw.mpx100:mpx100
65.1.50001fe150002f70.50001fe150002f7e,0
Override Path: NA
Path State: OK
Disabled: no
Initiator Port Name: iqn.1986-03.com.sun:sansun3,4000002a00ff
Target Port Name: 4000002a0000,iqn.1986-03.com.hp:fcgw.mpx100:mpx100
65.1.50001fe150002f70.50001fe150002f7e,0
Override Path: NA
Path State: OK
Disabled: no
Initiator Port Name: iqn.1986-03.com.sun:sansun3,4000002a00ff
Target Port Name: 4000002a0000,iqn.1986-03.com.hp:fcgw.mpx100:mpx100-
65.1.50001fe150002f70.50001fe150002f7f,0
Override Path: NA
Path State: OK
Disabled: no
Target Ports:
Name: 4000002a0000,iqn.1986-03.com.hp:fcgw.mpx100:mpx100
```

66.0.50001fe150002f70.50001fe150002f78,0

Relative ID: **0**

Name: **4000002a0000,iqn.1986-03.com.hp:fcgw.mpx100:mpx100-66.0.50001fe150002f70.50001fe150002f7a,0**

Relative ID: **0**

Name: **4000002a0000,iqn.1986-03.com.hp:fcgw.mpx100:mpx100-65.1.50001fe150002f70.50001fe150002f7e,0**

Relative ID: **0**

#

Configuring multipath with the OpenVMS iSCSI Initiator

Multipath support for the OpenVMS iSCSI Initiator is native to OpenVMS. No additional software is required for full iSCSI multipath support.

When the OpenVMS Initiator is loaded, it uses the manual or iSNS discovery mechanisms to locate all viable paths to all accessible storage targets. It maintains an active login with every path to each target. If the current active path fails, I/O can be automatically failed over to another available path.

As with other interconnects supported by OpenVMS, the multipath software performs initial path selection and is responsible for path failover in the event the active path fails. The user can effect multipath changes (such as manual path switching) using the DCL command:

```
SET DEVICE /qualifier /PATH=path-description-string device-name
```

Path description string format

iSCSI path description strings are significantly longer than the description strings used for other multipath interconnects, such as Fibre Channel. An example of a typical iSCSI path description string is shown in Figure 64 and Table 18.

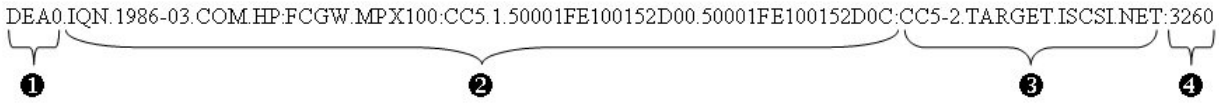


Figure 64 Typical iSCSI path description string

Table 18 Typical iSCSI path description string

Unit	Description
1	The iSCSI 'device' (Note that DEA0: is the pseudo-device associated with the software-based iSCSI Initiator.)
2	The iSCSI IQN target name presented by the mpx100/100b
3	The host name associated with the IPv4 address of the mpx100/100b iSCSI (GE) port presenting the target
4	The TCP port number of the mpx100/100b iSCSI (GE) port presenting the target

Displaying path information

To display a brief listing of the characteristics of a specific iSCSI multipath device, issue the command:

```
SHOW DEVICE /MULTIPATH device-name
```

An example of the command is shown in Figure 65.

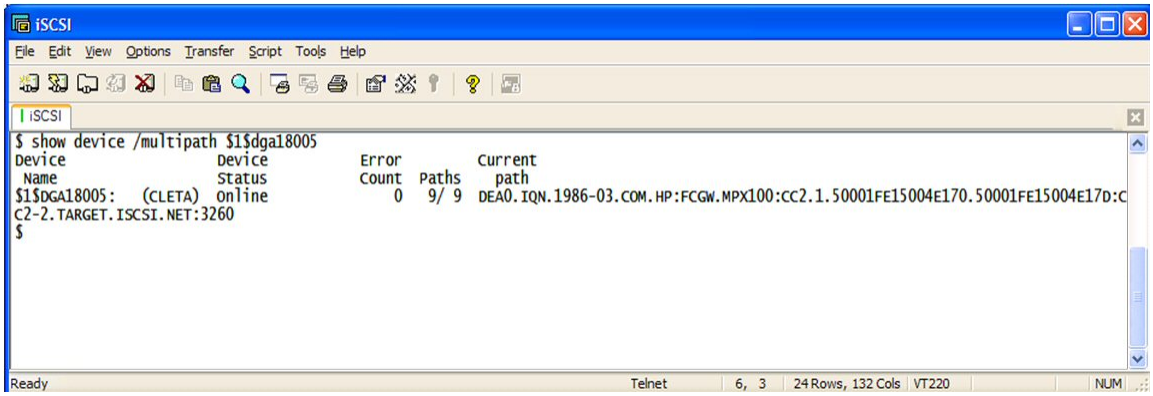


Figure 65 SHOW DEVICE / MULTIPATH Example

For more comprehensive information about an iSCSI device, including all available paths, issue the command:

```
SHOW DEVICE /FULL device-name
```

An example of the command is shown in Figure 66.

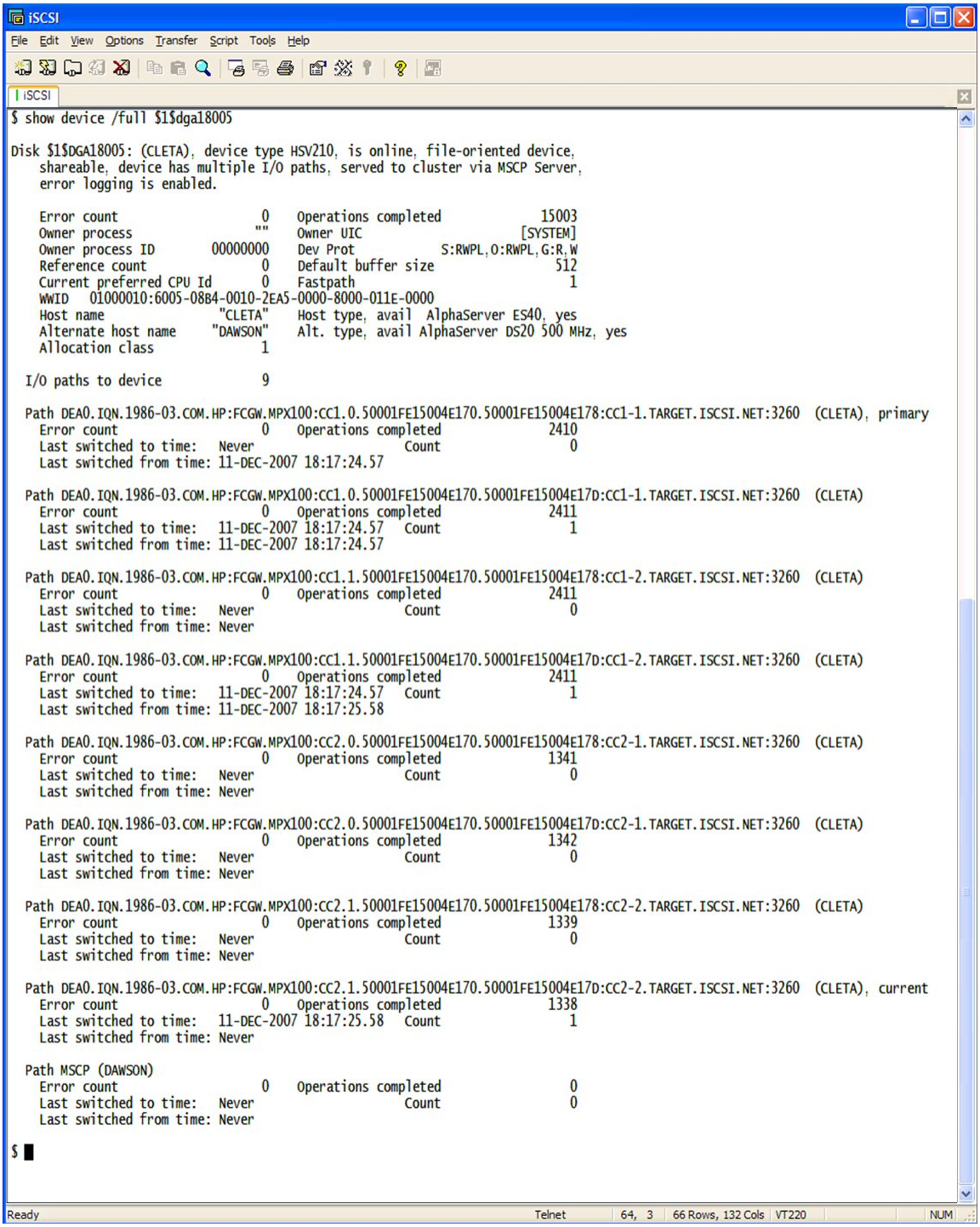

iSCSI
File Edit View Options Transfer Script Tools Help
iSCSI
$ show device /full 1dga18005
Disk 1DGA18005: (CLETA), device type HSV210, is online, file-oriented device,
shareable, device has multiple I/O paths, served to cluster via MSCP Server,
error logging is enabled.
Error count 0 Operations completed 15003
Owner process "" Owner UIC [SYSTEM]
Owner process ID 00000000 Dev Prot S:RWPL,O:RWPL,G:R,W
Reference count 0 Default buffer size 512
Current preferred CPU Id 0 Fastpath 1
WWID 01000010:6005-08B4-0010-2EA5-0000-8000-011E-0000
Host name "CLETA" Host type, avail AlphaServer ES40, yes
Alternate host name "DAWSON" Alt. type, avail AlphaServer DS20 500 MHz, yes
Allocation class 1
I/O paths to device 9
Path DEA0.IQN.1986-03.COM.HP:FCGW.MPX100:CC1.0.50001FE15004E170.50001FE15004E178:CC1-1.TARGET.ISCSI.NET:3260 (CLETA), primary
Error count 0 Operations completed 2410
Last switched to time: Never Count 0
Last switched from time: 11-DEC-2007 18:17:24.57
Path DEA0.IQN.1986-03.COM.HP:FCGW.MPX100:CC1.0.50001FE15004E170.50001FE15004E17D:CC1-1.TARGET.ISCSI.NET:3260 (CLETA)
Error count 0 Operations completed 2411
Last switched to time: 11-DEC-2007 18:17:24.57 Count 1
Last switched from time: 11-DEC-2007 18:17:24.57
Path DEA0.IQN.1986-03.COM.HP:FCGW.MPX100:CC1.1.50001FE15004E170.50001FE15004E178:CC1-2.TARGET.ISCSI.NET:3260 (CLETA)
Error count 0 Operations completed 2411
Last switched to time: Never Count 0
Last switched from time: Never
Path DEA0.IQN.1986-03.COM.HP:FCGW.MPX100:CC1.1.50001FE15004E170.50001FE15004E17D:CC1-2.TARGET.ISCSI.NET:3260 (CLETA)
Error count 0 Operations completed 2411
Last switched to time: 11-DEC-2007 18:17:24.57 Count 1
Last switched from time: 11-DEC-2007 18:17:25.58
Path DEA0.IQN.1986-03.COM.HP:FCGW.MPX100:CC2.0.50001FE15004E170.50001FE15004E178:CC2-1.TARGET.ISCSI.NET:3260 (CLETA)
Error count 0 Operations completed 1341
Last switched to time: Never Count 0
Last switched from time: Never
Path DEA0.IQN.1986-03.COM.HP:FCGW.MPX100:CC2.0.50001FE15004E170.50001FE15004E17D:CC2-1.TARGET.ISCSI.NET:3260 (CLETA)
Error count 0 Operations completed 1342
Last switched to time: Never Count 0
Last switched from time: Never
Path DEA0.IQN.1986-03.COM.HP:FCGW.MPX100:CC2.1.50001FE15004E170.50001FE15004E178:CC2-2.TARGET.ISCSI.NET:3260 (CLETA)
Error count 0 Operations completed 1339
Last switched to time: Never Count 0
Last switched from time: Never
Path DEA0.IQN.1986-03.COM.HP:FCGW.MPX100:CC2.1.50001FE15004E170.50001FE15004E17D:CC2-2.TARGET.ISCSI.NET:3260 (CLETA), current
Error count 0 Operations completed 1338
Last switched to time: 11-DEC-2007 18:17:25.58 Count 1
Last switched from time: Never
Path MSCP (DAWSON)
Error count 0 Operations completed 0
Last switched to time: Never Count 0
Last switched from time: Never
$
Ready
Telnet
64, 3
66 Rows, 132 Cols
VT220
NUM

Figure 66 SHOW DEVICE/FULL Example

Manual path switching

At times, you may need to manually switch a device's current path. One common reason for doing this would be to manually distribute an I/O load. To perform a manual path switch, use the following command:

```
SET DEVICE /SWITCH /PATH=path-description-string device-name
```

An example of the command is shown in Figure 67.

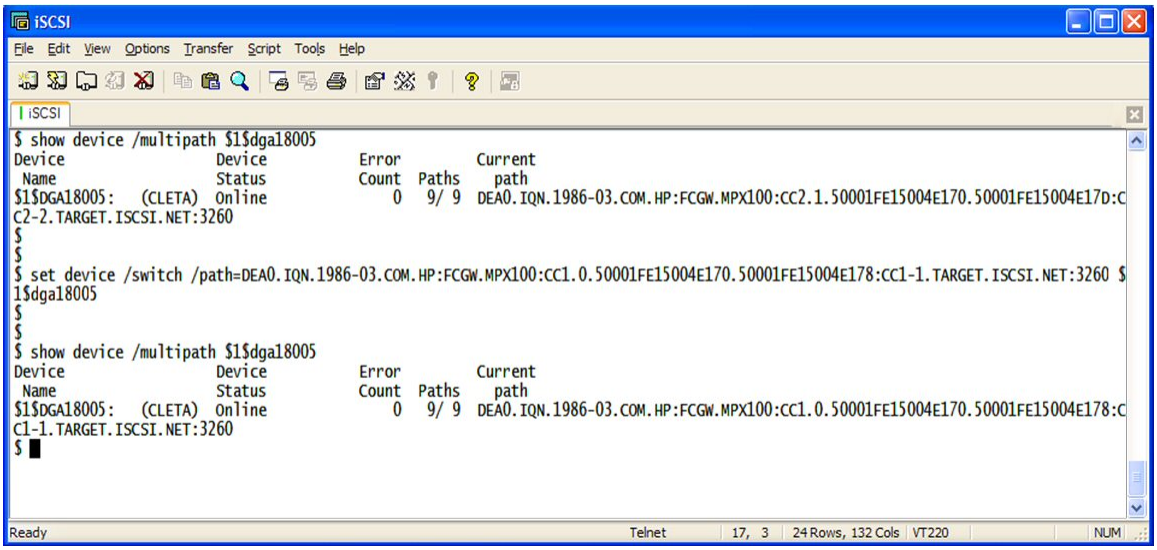


Figure 67 SET DEVICE/SWITCH/PATH Example

Device Mapper Multipath Enablement Kit for HP StorageWorks Disk Arrays

The HPDM Multipath software kit is an HP-released Device Mapper multipath binary, based on Device Mapper Multipath, which is included in Linux Operating System distributions, with enablement for HP StorageWorks Disk Arrays. Device Mapper is an infrastructure in the Linux kernel. It provides a generic way to create virtual layers of block devices.

Supported operating systems

Table 19 lists supported operating systems.

Table 19 Operating Systems supported by the Device Mapper Multipath Enablement Kit

Red Hat Enterprise Linux	SUSE LINUX Enterprise Server
Red Hat Enterprise Linux 5 errata 2.6.18–8.1.6.el5 or later	SUSE LINUX Enterprise Server 10
Red Hat Enterprise Linux 5 Update 1	SUSE LINUX Enterprise Server 10 Service Pack 1
Red Hat Enterprise Linux 4 Update 6	SUSE LINUX Enterprise Server 9 Service Pack 4
Red Hat Enterprise Linux 4 Update 5	SUSE LINUX Enterprise Server 9 Service Pack 3 errata 2.6.5–7.283 or later

NOTE:

The Device Mapper Multipath Enablement Kit provides for path failover only for iSCSI devices.

Installing the Device Mapper Multipath Enablement Kit

To install the kit, follow the steps described in the *Installation and Reference Guide Device Mapper Multipath Enablement Kit for HP StorageWorks Disk Arrays*:

http://h20000.www2.hp.com/bizsupport/TechSupport/SoftwareDescription.jsp?swItem=co-58129-1&lang=en&cc=us&idx=1&mode=4&

iSCSI Initiator timeout settings for Red Hat 4 and SUSE 9 systems

To define the iSCSI Initiator timeout settings for Red Hat 4 and SUSE 9 systems, move the `/etc/iscsi.conf` file to the Session Timeout Settings section and modify as follows:

```
ConnFailTimeout=5
```

iSCSI Initiator timeout settings for Red Hat 5 and SUSE 10 systems

To define the iSCSI Initiator timeout settings for Red Hat 5 and SUSE 10 systems, modify either the `/etc/iscsi/iscsid.conf` or the `/etc/iscsid.conf` line as follows:

```
node.session.timeo.replacement_timeout=5
```

HPDM Multipath restrictions

HPDM Multipath has the following restrictions:

- HPDM Multipath does not provide an auto-failback feature for devices presented through iSCSI Initiators. HP recommends running the following commands to recover the failed paths and make them available for I/O failback (a quiesce of I/O is necessary; a reboot also may be required):

  ```
  # /etc/init.d/iscsi restart or # /etc/init.d/open-iscsi restart
  # /sbin/multipath –v3
  ```

- No clustering support
- If Device Mapper Multipath is configured on iSCSI devices (on hosts running SLES OS), the system may hang during reboot. To avoid this, HP highly recommends running the following command before rebooting the system:

  ```
  # /sbin/multipath –F
  ```

7 Using HP Command View EVA to configure LUNs to iSCSI Initiators

This chapter contains the following topics:

- Initial discovery of the mpx100 via HP Command View EVA, page 127
- Creating an iSCSI initiator host via HP Command View EVA, page 128
- Presenting a virtual disk to an iSCSI initiator via HP Command View EVA, page 129
- Unpresenting a virtual disk to an iSCSI initiator via HP Command View EVA, page 129

HP Command View allows LUN management for iSCSI Initiators through additional screens. Under host:

- A new entity named iSCSI MPX Host is automatically created during iSCSI device discovery. This new entity behaves like any other fibre Channel host entry.
- iSCSI Initiators are added as individual iSCSI host entries, which are either created by the user through an existing Add Host screen, or automatically created.

NOTE:

All Command View EVA features for iSCSI connectivity are supported with server-based management and array-based management.

Initial discovery of the mpx100/100b via HP Command View EVA

Discovery of the mpx100/100b connected to the EVA is initiated from the iSCSI Devices properties page. (It is assumed that you have configured all hardware.)

NOTE:

HP Command View communication with the mpx100/100b is done out-of-band through the IP connection of the HP Command View Server to the mpx100/100b management port's IP address.

NOTE:

Command View EVA is supported with the mpx100/100b using IPv4 or IPv6. Before enabling IPv6 on the mpx100/100b and the management server, ensure that the mpx100/100b can communicate with the management server using IPv4. To prevent loss of connectivity, do not disable IPv4 and IPv6 at the same time. If you configure IPv6 on any mpx100/100b iSCSI port, you must also configure IPv6 on the management server.

To discover the mpx100/100b:

1. Start HP Command View EVA and click the **EVA storage system** icon that is configured to present iSCSI storage.
2. Click the **iSCSI Devices** folder under Hardware.
3. Click **Discover iSCSI Devices** on the Properties bar. If mpx100/100b devices are discovered, a new icon named iSCSI Controller appears under the iSCSI Devices folder. If the devices are not automatically discovered, click **Add iSCSI Device** and add the mpx100/100b management port IP address.

NOTE:

A single host entry named iSCSI host is automatically created under the Host folder, regardless whether one or two iSCSI controllers are discovered. For multipath purposes, HP Command View EVA treats both the mpx100/100b devices as a single host when presenting or *unpresenting* Fibre Channel or iSCSI LUNs.

4. Click the **IP Ports** tab of the iSCSI Controller icon and configure the mpx100/100b iSCSI IP port address and subnet mask. There are two IP ports available for iSCSI communications. Configure as needed.

NOTE:

Changes must be saved before the new IP Port address is available to iSCSI Initiators.

Creating an iSCSI Initiator host via HP Command View EVA

To create an HP Command View host entry for an iSCSI Initiator:

1. Click **Add Host** under the Hosts folder. In the Add a Host screen (Figure 68) click the **iSCSI** radio button in the Type field. The Basic Settings screen is automatically refreshed to the iSCSI fields necessary to create an iSCSI host entry.
2. Enter the Host name. This host name is used by HP Command View to display under the **Hosts** folder.
3. In the iSCSI Node Name field, select an iSCSI Initiator's IQN name. The IQN is assigned to the iSCSI Host Name entry in the same manner that a WWPN is assigned to a Fibre Channel host name.

NOTE:

The iSCSI Initiator must first successfully log in to the mpx100/100b in order for HP Command View to display the iSCSI Initiator's IQN. See Setting up the iSCSI initiator and storage, page 69 to install and configure an iSCSI Initiator and access the mpx100/100b.

IMPORTANT:

If an iSCSI Initiator is logged into both the mpx100/100b devices, it will only display the iSCSI Initiator IQN once. HP Command View EVA recognizes that the iSCSI Initiator is logged into both.

4. In the Operating system field, select the appropriate operating system for the iSCSI Initiator, as follows:

Supported iSCSI Initiator	Operating system setting with Command View 8.0
Windows	Windows
Red Hat or SUSE Linux	Linux/Mac OS
Macintosh	Linux/Mac OS
VMware	VMware
Solaris	Solaris
OpenVMS	OpenVMS

5. Click **Add Host** to save the changes.

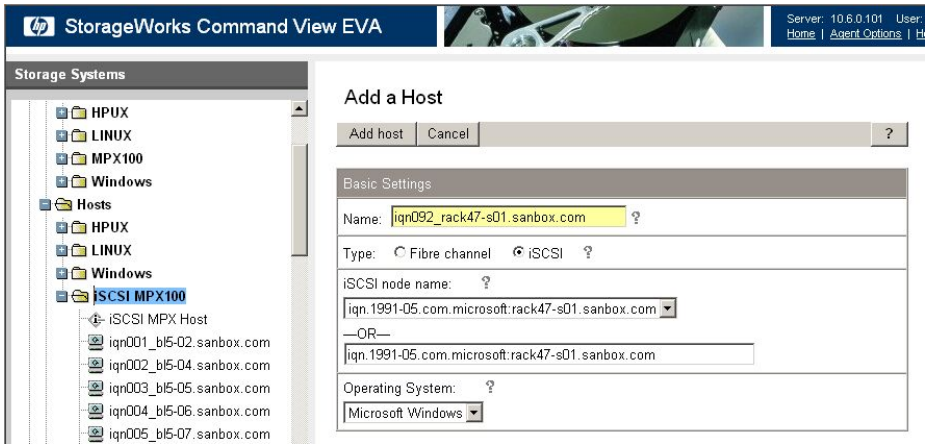


Figure 68 Add a host for Command View EVA

Presenting a virtual disk to an iSCSI Initiator via HP Command View EVA

To present a virtual disk to an iSCSI Initiator:

1. Under the Virtual Disks folder select the appropriate Vdisk name.
2. Click the **Presentation** tab in the VDisk Properties screen.
3. Click the **Present** tab.
   HP Command View lists all host entries for both Fibre Channel hosts and iSCSI hosts.
4. Select the appropriate iSCSI host entry and click **Present Vdisk**.

Unpresenting a virtual disk to an iSCSI Initiator using HP Command View EVA

To unpresent a virtual disk to an iSCSI Initiator:

1. Under the **Virtual Disks** folder select the appropriate Vdisk name.

2. Click the **Presentation** tab in the VDisk Properties screen.
   HP Command View lists the iSCSI host assigned to the VDisk.
3. Select the appropriate iSCSI host and click the **Unpresent host(s)** button.

NOTE:

If multipathing is active, HP Command View EVA recognizes and automatically unpresents the LUN from the same iSCSI Initiator on both the mpx100 and mpx100b.

The LUN is unpresented to the iSCSI Initiator when the virtual disk is no longer presented to the iSCSI Initiator.

8 iSCSI Boot from SAN

iSCSI Boot from SAN allows systems to boot from EVA disks using the EVA iSCSI connectivity option in Single Path configurations only.

This chapter contains the following topics:

- HP Multifunction Gigabit server adapter, page 131
- QLogic iSCSI Host Bus adapter (HBA), page 132
- Installing the OS on HP Multifunction Gigabit Server Adapters, page 132
- Configuring the BIOS on QLogic iSCSI HBAs, page 133
- Installing the OS on QLogic iSCSI HBAs, page 134

HP Multifunction Gigabit server adapter requirements

The following sections summarize HP Multifunction Gigabit server adapter requirements.

Supported operating systems for the HP Multifunction Gigabit server adapter

The HP Multifunction Gigabit server adapter supports the following operating systems:

NOTE:

The MPX boot support is a subset of what is in the *HP iSCSI Boot for Linux User Guide* and the *HP iSCSI Boot for Windows User Guide*. It is important to note that the mpx100 does not support all of what is listed in the user guide. Instead, support is provided per the following list.

- Red Hat Enterprise Linux 4 AS Update 4, or later
- SUSE Linux Enterprise Server 9 SP3, or later
- SUSE Linux Enterprise Server 10
- SUSE Linux Enterprise Server 10 SP1
- Red Hat 5
- Windows Server 2003

Supported hardware

The hardware supported by the HP Multifunction Gigabit server adaptor includes:

- HP NC370T PCI-X Multifunction Gigabit Server Adapter
- HP NC370F PCI-X Multifunction Gigabit Server Adapter
- HP NC373F PCI Express Multifunction Gigabit Server Adapter
- HP NC373T PCI Express Multifunction Gigabit Server Adapter
- HP NC370i PCI-X Multifunction Gigabit Server Adapter
- HP NC371i PCI-X Multifunction Gigabit Server Adapter

- HP NC373i PCI Express Multifunction Gigabit Server Adapter
- HP NC373m PCI Express Dual Port Multifunction Gigabit Server Adapter for c-Class BladeSystem
- HP NC374m PCI Express Dual Port Multifunction Gigabit Server Adapter
- HP NC380T PCI Express Dual Port Multifunction Gigabit Server Adapter

iSCSI option ROM

Version 1.18 is the minimum required for use with the EVA iSCSI connectivity option.

NOTE:

For Windows, Version 2.4.2.0 is the minimum required mpx firmware.

QLogic iSCSI Host Bus adapter

The following sections summarize QLogic iSCSI Host Bus adapter (HBA) requirements.

Supported operating systems for the QLogic iSCSI HBA

The QLogic iSCSI HBA supports the following operating systems:

- Red Hat Enterprise Linux 5, Update 1
- SUSE Linux Enterprise Server 10
- SUSE Linux Enterprise Server 10 SP1
- Red Hat Enterprise Linux 4 AS Update 5, Update 6 (requires driver diskette kit: DD-Kit)
- SUSE Linux Enterprise Server 9 SP3, SP4 (requires driver diskette kit: DD-Kit)
- Windows Server 2008
- Windows Server 2003

Go to http://www.qlogic.com/products/iscsi_products_hba.asp to obtain the driver diskette kit.

Supported hardware

QLA4052C and QLA4062C is supported.

Supported BIOS

Obtain the latest supported BIOS from the QLogic website:

www.qlogic.com

Installing the OS on HP Multifunction Gigabit Server Adapters

See the *HP iSCSI Boot for Linux User Guide* for instructions for installing the OS in HP Multifunction Gigabit server adapters:

http://h20000.www2.hp.com/bizsupport/TechSupport/DocumentIndex.jsp?contentType=SupportManual&lang=en&cc=us&docIndexId=179111&taskId=101&prodTypeId=329290&prodSeriesId=1155257

NOTE:

When the iSCSI boot path is initialized and after system POST, the iSCSI Option ROM is successfully logged in to the mpx100. Use HP Command View EVA to present the boot LUN to the initiator, and then set the initiator host mode to Linux/Mac.

Configuring the BIOS on QLogic iSCSI HBAs

To configure the BIOS:

IMPORTANT:

Before you begin, use the F9 key to disable any other internal storage adapters.

1. Press **Ctrl-Q** to enter the Fast!UTIL program.
2. Select the desired HBA.
3. Select **Configuration Settings**.
4. Select **Host Adapter Settings**.
5. Set the Initiator IP Settings.
6. Set the desired Initiator iSCSI Name.
7. Press **ESC**.
8. Select **iSCSI Boot Settings**.
9. Set Adapter Boot Mode to Manual.
10. Select **Primary Boot Device Settings**.
11. Set the target IP address and Boot LUN.
12. Save changes.
13. Select **iSCSI Boot Settings**.
14. Select **Primary**, and the press **Enter** to register the initiator name.
15. Use HP Command View EVA to present the LUN to the initiator.
16. Return to the initiator, and press **ESC** twice to display the **iSCSI Boot Settings** menu.
17. Choose **Primary** and press **Enter** to start a scan.
18. Verify that the correct target is highlighted, and then press **Enter** to display the presented LUN.
19. Select the LUN and press **Enter**.
    The iSCSI target name appears next to the IP address.
20. Save the changes and reboot the server.

NOTE:

For additional information about BIOS settings, see the *QLogic BIOS Readme* file:
http://support.qlogic.com/support/product_resources.asp?id=964

Installing the OS on QLogic iSCSI HBAs

To install Linux:

1. Obtain the appropriate installation media.
2. Insert the DVD/CD and follow the on-screen instructions.
3. For those operating systems requiring the driver diskette, see the Readme files for installation instructions on the QLogic download web page:
   http://support.qlogic.com/support/product_resources.asp?id=964

To install Windows Server 2008/2003:

1. Obtain the appropriate installation media.
2. Boot the DVD/CD.
3. Use the F6 key to install the QLogic Storport iSCSI HBA driver via floppy diskette.
4. Follow the on-screen instructions to complete the installation.

To add multiple paths to the Boot LUN:

1. Ensure that multipathing software has been installed using the Microsoft MPIO.
2. Configure the iSCSI HBA using SANsurfer to add the additional target ports.
3. Shut down the host.
4. Use Command View to unpresent the boot LUN.
5. Present the boot LUN again to ensure that all paths are available.
6. Boot the host and verify the multiple paths to the boot LUN.

9 EVA4400 iSCSI Connectivity 32 Initiator Upgrade License

The EVA4400 iSCSI connectivity option (mpx100b) is a licensed version of the EVA iSCSI connectivity option mpx100). The mpx100b allows storage connectivity to the EVA4400 only and licenses the number of iSCSI Initiators or hosts that can be actively mapped or connected to storage LUNs.

Initially, the mpx100b supports a maximum of 16 iSCSI Initiators with LUNs mapped to them. With the installation of the EVA4400 iSCSI Connectivity 32 Initiator Upgrade License, this limit can be increased. Two upgrade licenses can be installed on an mpx100b. The first upgrade license increases the total number of iSCSI Initiators that can be configured with mpx100b storage LUNs to 48. A second upgrade license increases the number of iSCSI Initiators to the maximum support limit of 150.

License keys are based on the serial number of the mpx100b and cannot be transferred from one mpx100b to another. The license key request form is available at: http://www.webware.hp.com.

Installing the EVA4400 iSCSI Connectivity 32 Initiator Upgrade License

Install the upgrade license using the HP StorageWorks mpx Manager application or the CLI.

To install the upgrade license using the CLI:

1. Open a command window according to the type of server and connection:
   - Ethernet (all platforms): Open a Telnet session with the default mpx100/100b IP address, and log in to the mpx100/100b with the default account name and password:

     (`guest/password`)

     ```
     telnet 10.0.0.1
     username: guest
     password: password
     ```
   - Serial—Windows:
     - Open the HyperTerminal application on a Windows platform.
     - Select **Start > Programs > Accessories > HyperTerminal > HyperTerminal**.
     - Select the connection you created earlier, and then click **OK**.
   - Serial—Linux:
     - Open a command window and enter the following command:

       ```
       minicom
       ```

2. Open an admin session and enter the following commands to install the license:
   a. Enter admin mode:

      ```
      mpx100b #>
      admin start
      Password: config
      (default password)
      ```

   b. Make sure the system date is set by entering the command:

      ```
      mpx100b (admin) #> date
      ```

      The system returns today's date and the current time. For example:

      ```
      Thu Feb 28 16:56:00 2008
      ```

   c. If the date is not set, you must set it. The format for entering the date is MMDDhhmmYYYY. Enter the date as in the following example:

      ```
      mpx100b (admin) #> date 022816562008
      ```

      The system returns the date and time entered:

      ```
      Thu Feb 28 16:56:00 2008
      ```

   d. Enter the following CLI command at the prompt and then enter the license key exactly as shown on the License Certificate:

      ```
      mpx100b (admin) #> set features
      ```

      A list of attributes with formatting and current values follows. Enter a new value or press **Enter** to accept the current value. If you want to terminate this process before reaching the end of the list, press **q** or **Q** and **Enter** simultaneously.

   e. Enter the feature key to be saved or activated:
      `1000000-LCETMQV1000VM-B8A27CF2-iSCSI-Server`

      All attribute values that have been changed are saved.

   f. Verify that the licenses are installed on the mpx100b:

      ```
      mpx100b (admin) #> show features
      ```

      The system returns the following information:

      ```
      Feature Key Information
      - - - - - - - - - - -
      Key          1000000-LCETMQV1000-B8A27CF2-iSCSI-Server
      Date Applied Thu Feb 28 16:56:00 2008
      ```

Installing the EVA4400 iSCSI Connectivity 32 Initiator Upgrade License with mpx Manager GUI

1. Start the HP StorageWorks mpx Manager.
2. In the left pane, select the desired mpx100b.
3. In the right pane, select the **Features** tab and then click **Add**.

4. Enter the license key in the New License Key dialog box (Figure 69).

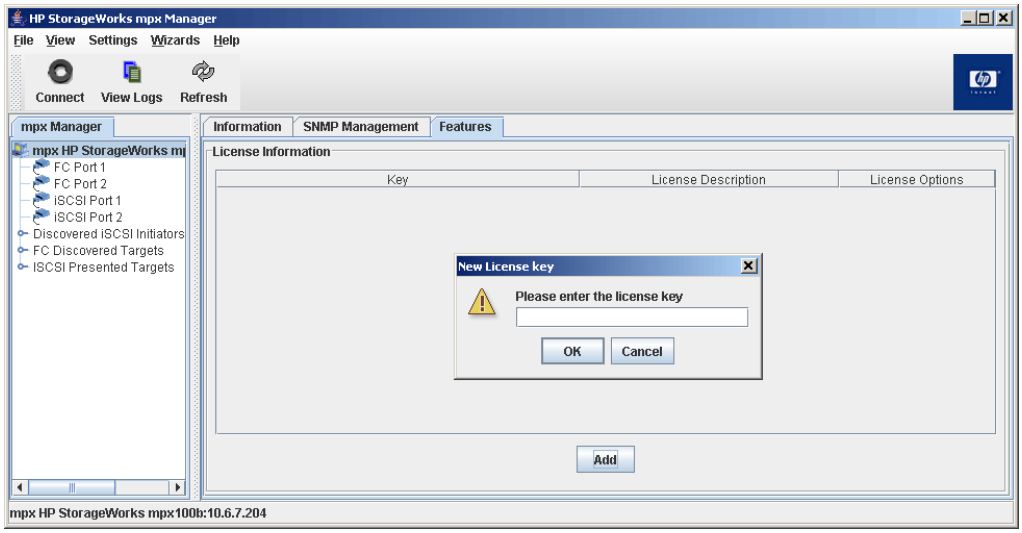


Figure 69 New license key dialog box

5. Click **OK**.

   The Add new license key complete dialog box appears (Figure 70).

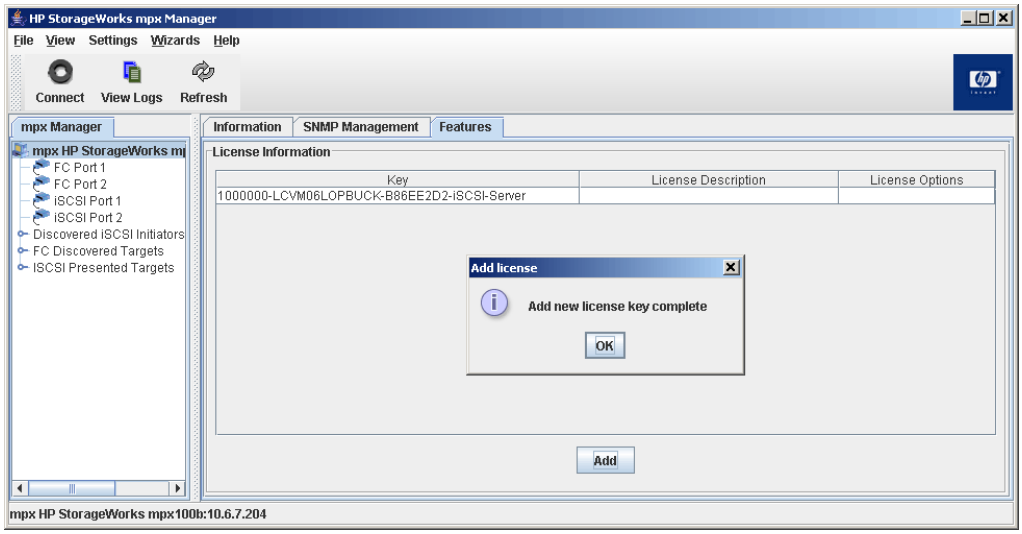


Figure 70 License key complete dialog box

6. Click **OK**.

The newly-installed license key is listed (Figure 71).

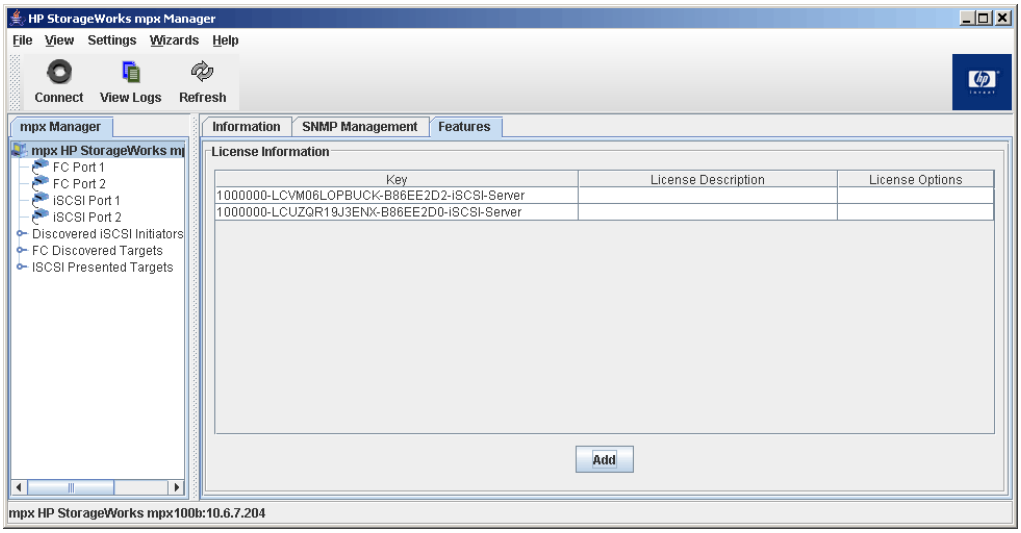


Figure 71 Display installed license key

A Command line interface

Command line interface for the mpx100/100b

This appendix contains information about using the CLI for mpx100/100b, including the command syntax with examples.

mpx100/100b log-on, user accounts, and backup and restore

This section contains information about he logging on to a SAN mpx100/100b, mpx100/100b user accounts, and backing up and restoring the mpx100/100b.

Logging on to a SAN mpx100/100b

To log on to an mpx100/100b using Telnet, open a command line window on the server, and then enter the `telnet` command followed by the mpx100/100b management port IP address:

```
# telnet ip-address
```

A Telnet window opens prompting you for a login. Enter an account name and password.

To log on to a switch through the serial port, configure the server port with the following settings:

- 115200 baud
- 8-bit character
- 1 stop bit
- No parity

User accounts

The mpx100/100bs come from the factory with the following user account already defined:

```
Account name: guest
```

```
Password: password
```

For more information, see “Commands” on page 139 and “Password command” on page 149.

Backup and restore

Use the FRU command to back up and restore the mpx100/100b configurations. This backup will protect your work and be useful as a template in configuring other mpx100's/100b's.

Commands

The mpx100/100b command syntax is as follows:

command

keyword

keyword *[value]*

keyword [*value1*] [*value2*]

The command is followed by one or more keywords. Consider the following rules and conventions:

- Commands and keywords are case-insensitive.
- Required keyword values appear in standard font: [*value*]. Optional values are shown in italics: *[value]*.
- Underlined portions of the keyword in the command format indicate the abbreviated form that can be used. For example, the `Delete` keyword can be abbreviated `Del`.

The command-line completion feature makes entering and repeating commands easier. Table 20 lists the command-line completion keystrokes.

Table 20 Command-line completion

Keystroke	Effect
Tab	Completes the command line. Enter at least one character and press **Tab** to complete the command line. If more than one possibility exists, press **Tab** again to display all possibilities.
Up arrow	Scrolls backward through the list of previously entered commands.
Down arrow	Scrolls forward through the list of previously entered commands.
Ctrl+E	Moves cursor to the end of the command line.

The command set performs monitoring and configuration tasks:

- Commands related to monitoring tasks are available to all account names.
- Commands related to configuration tasks are available only within an Admin session.
- An account must have Admin authority to enter the `Admin Start` command, which opens an Admin session. See the "Admin command" on page 140.

Admin command

Opens and closes the Admin session. The Admin session provides commands that change mpx100/100b configurations. Only one Admin session can be open on the mpx100/100b at any time. An inactive Admin session will time out after a period of time which can be changed using the `Set Properties` command.

Authority

Admin

Syntax

```
adminstart (or begin) end (or stop) cancel
```

Keywords

`start (or begin)`

Opens the Admin session.

`end (or stop)`

Closes the Admin session. The `Logout`, `Shutdown`, and `Reset` commands will also end an Admin session.

`cancel`

Terminates an Admin session opened by another user. Use this keyword with care because it terminates the Admin session without warning the other user and without saving pending changes.

Notes

Closing a Telnet window during an admin session does not release the session. In this case, you must either wait for the Admin session to time out, or use the `Admin Cancel` command.

Examples

The following example shows how to start and end an Admin session:

```
mpx100 #> admin start

Password: ******

mpx100(admin) #>
.
.
.
mpx100(admin) #> admin end
mpx100 #>
```

Beacon command

Enables or disables the flashing of the LEDs. This command does not require an Admin session.

Authority

None

Syntax

`beacon`

on
off

Keywords

`on`: Turns on the mpx100/100b beacon.

`off`

`off`: Turns off the mpx100/100b beacon.

Example

```
mpx100 #> beacon on
```

Date command

Displays or sets the date and time. The information string must be provided in the format `MMDDhhmmCCYY`. The new date and time take effect immediately.

Authority

Admin session only to set date

Syntax

`date`

`[MMDDhhmmCCYY]`

Keywords	[MMDDhhmmCCYY] Specifies the date. This requires an admin session. Exception: if you omit [MMDDhhmmCCYY], the current date is displayed, which does not require an admin session.
Notes	Network Time Protocol (NTP) must be disabled to set the time with the Date command. See "Set command" on page 152 for information about NTP.
Example	The following is an example of the Date command: mpx100 (admin) #> date 010314282006 Tue Jan 3 14:28:00 2006 mpx100 (admin) #> date Tue Jan 3 14:28:14 2006

Clear command

Allows you to remove all entries from the mpx100/100b's log file and/or reset the Fibre Channel and iSCSI statistic counters.

Authority	Admin session only to set
Syntax	clearlogs stats
Keyword	logs
Example	The following is an example of the clear command: mpx100 #>clear logs mpx100 #>clear stats

FRU command

Saves and restores the mpx100/100b configuration.

Authority	Admin session only to set
Syntax	fru restore save

Keywords

`restore`: The FRU restore command requires that the user first ftp the tar file containing the desired configuration to the mpx100/100b. When this command is issued, it prompts the user for the restore level. The user has the option of fully restoring the mpx100/100b configuration (all configuration parameters and LUN mappings) or restoring only the LUN mappings. The restored configuration does not take effect until the mpx100/100b is rebooted.

`save`: The FRU save command creates a tar file containing the mpx100/100b's persistent data, configuration, and LUN mappings, and stores the file in the mpx100/100b `/var/ftp` directory. The user must then ftp the bin file from the mpx100/100b.

Examples

The following is an example of the `fru` command:

```
mpx100/100b (admin) #> fru restore
```

A list of attributes with formatting and current values follows.
Enter a new value or press Enter to accept the current
value. If you wish to terminate this process before reaching the end of the list press 'q' or 'Q' and Enter.
Type of restore (0=full, 1=mappings only) [full]
FRU restore completed.
Reboot the system for configuration to take effect.

The following is an example of the `FRU Restore Save` command:

mpx100 (admin) #> fru save
FRU save completed. Configuration File is HP_Storageworks_FRU.bin
Please use FTP to extract the file out from the System.

Help command

Displays a list of the CLI commands and their syntax.

Authority

Syntax `help`

Example

The following is an example of the `help` command:

```
mpx100 (admin) #> help
mpx100 #> help

 admin [ begin | end | start | stop | cancel ]
 beacon [ on | off ]
 date [ <MMDDhhmmCCYY> ]   clear [ logs | stats ]
 fru [ restore | save ]
 history
 image [ cleanup | list | unpack ]
    image cleanup
    image list
    image unpack [  ]
  initiator [ add | mod | rm ]
  logout
  lunmask [ add | rm ]
  passwd
  ping
  quit
  reboot
 reset factory
 save [ capture | logs | traces ]
 set [ chap       | fc         | features       | iscsi
      isns       | mgmt       | ntp            | properties
      snmp       | system ]
    set chap
    set fc  [ <PORT NUM> ]
    set features
    set iscsi  [ <PORT NUM> ]
    set isns [ <PORT NUM> ]
    set mgmt
    set ntp
    set properties
    set snmp [trap_destinations [ <DEST NUM> ]]
    set system
 show [ chap               | fc       | features       | initiators
       initiators_lunmask | iscsi     | isns           | logs
       luninfo            | luns      | lunmask        | memory
       mgmt               | ntp       | perf           | presented_targets
       properties         | snmp      | stats          | system
       targets ]
    show chap
    show fc  [ <PORT NUM> ]
    show features
    show initiators [ fc | iscsi ]
    show initiators_lunmask
    show iscsi  [ <PORT NUM> ]
    show isns [ <PORT NUM> ]
    show logs [ <ENTRIES> ]
    show luninfo
    show luns
    show lunmask
    show memory
    show mgmt
    show ntp
    show perf [ byte | init_rbyte | init_wbyte | tgt_rbyte | tgt_wbyte ]
    show presented_targets [ fc | iscsi ]
    show properties
    show snmp
```

```
    show stats
    show system
    show targets [ fc | iscsi ]
shutdown
target [ add | rm ]
targetmap [ add | rm ]  - Not supported
```

History command

Displays a history of the commands the user has issued through the CLI.

Authority

Admin session only to set

Syntax

`history`

Notes

Closing a Telnet window during an admin session does not release the session. You must either wait for the admin session to time out, or use the `Admin Cancel` command.

Example

The following is an example of the `history` command:

```
mpx100 (admin) #> history
mpx100 (admin) #> history
1: admin start
2: help
3: history
mpx100r (admin) #>
```

Image command

Updates and the mpx100/100b firmware image and cleans up (removes) the image files in the mpx100/100b `/var/ftp` directory.

Authority

Admin session only to set

Syntax

`image`

```
cleanup
unpack
list
```

Keywords

`cleanup`: Removes any firmware image filed in the mpx100/100b `/var/ftp` directory. These are files transferred by the user when updating the mpx100/100b firmware image.

`unpack [<filename>]`: Unpacks the firmware image file specified in the *`filename`* parameter and installs the firmware image on the mpx100/100b. The mpx100/100b must be rebooted for the new firmware image to be activated. The firmware image file must first have been transferred to the mpx100/100b `/var/ftp` directory using ftp.

`list`: Displays the firmware files available for load.

Example

The following is an example of the `image` command:

```
mpx100 (admin) #> image unpack iSR-6140-2_0_0_1.bin
Unpack Completed. Please reboot the system for FW to take effect.
mpx100 (admin) #> reboot
Are you sure you want to reboot the System (y/n): y
System will now be rebooted...
```

Initiator command

Adds, modifies, or removes an initiator in the mpx100/100b database.

Authority

Admin session only to set

Syntax

```
initiator

add
mod
remove
```

Keywords

`add`: Adds an initiator to the mpx100/100b database.

`mod`: Modifies the settings of an initiator.

`remove`: Removes an initiator.

Examples

The following is an example of the `initiator add` command:

```
A list of attributes with formatting and current values follows.
Enter a new value or simply press  Enter to accept the current value.
If you wish to terminate this process before reaching the end of the list
press 'q' or 'Q' and the Enter key to do so.
iSCSI Initiator Name (Max = 256 characters) [ ]
iqn.1991-05.com.microsoft:hp-09sd5i4l
OS Type (0=MS Windows, 1=Linux 2=Mac [MS Windows ]
CHAP (0=Enable, 1=Disable) [Disabled ]
All attribute values  that have been changed are saved.
```

The following is an example of the `initiator mod` command:

```
mpx100 (admin) #> initiator mod
Index (WWNN/iSCSI Name)
----------------
0 iqn.1991-05.com.microsoft:hp-09sd5i4l
Select an Initiator from the list above ('q' to quit): 0
A list of attributes with formatting and current values will follow.
Enter a new value or  press  Enter  to accept the current value.
If you wish to terminate this process before reaching the end of the list
press 'q' or 'Q' and  Enter  to do so.
OS Type (0=MS Windows, 1=Linux) [MS Windows ] 1
CHAP (0=Enable, 1=Disable) [Disabled ]
All attribute values  that have been changed are saved.
```

The following is an example of the `initiator remove` command:

```
mpx100 (admin) #> initiator rm
Index (WWNN/iSCSI Name)
----------------------
0 iqn.1991-05.com.microsoft:hp-09sd5i4l
Select an Initiator from the list above ('q' to quit): 0
All attribute values  that have been changed are saved.
```

Logout command

Exits the CLI and returns the operator to the login prompt.

Authority	Admin session only to set
Syntax	`logout`
Example	`mpx100 #>`

LUNmask command

Maps a target LUN to an initiator. Also removes mappings. The command prompts the operator to pick from a list of targets, LUNs, and initiators.

Authority	Admin session only to set

Syntax	`LUNmask`
	
	`add`
	`remove`

Keywords	`add`: Map a LUN to an initiator. The operator is prompted to select an initiator from a list of initiators, then to select a target from a list of targets and finally to select the LUN that is to be mapped from a list of LUNs for the selected target. `remove`: Remove the mapping of a LUN from an initiator. The operator is prompted to select a target from a list of targets, then to select the LUN from a list of LUNs for the selected target, and finally to select the initiator that is to be unmapped from a list of initiators.
Notes	Closing a Telnet window during an admin session does not release the session. You must either wait for the admin session to time out, or issue the `Admin Cancel` command.

Examples

The following is an example of the `LUNmask add` command:

```
mpx100 (admin) #> LUNmask add

Index  (WWNN/iSCSI Name)
-----------------
0            iqn.1991-05.com.microsoft:hp-09sd5i4l
Select an Initiator from the list above ('q' to quit): 0

Index  (WWNN,WWPN/iSCSI Name)
-------------------------
0       20:00:00:20:37:fd:8b:ab,22:00:00:20:37:fd:8b:ab
1       20:00:00:20:37:fd:8a:b0,22:00:00:20:37:fd:8a:b0
2       20:00:00:20:37:fd:9c:f7,22:00:00:20:37:fd:9c:f7
3       20:00:00:20:37:fd:8d:00,22:00:00:20:37:fd:8d:00
Please select a Target from the list above ('q' to quit): 0
 LUN   WWULN                                    Vendor
  -------------------
 0     20:00:00:20:37:fd:8b:ab:00:00:00:00:fc:b7:3f:fa SEAGATE
Please select a LUN to present to the initiator ('q' to quit): 0

All attribute values that have been changed are saved.
```

The following is an example of the `LUNmask remove` command:

```
LUNmask rm

 Index  (WWNN,WWPN/iSCSI Name)
  -------------------------
 0       20:00:00:20:37:fd:8b:ab,22:00:00:20:37:fd:8b:ab
 1       20:00:00:20:37:fd:8a:b0,22:00:00:20:37:fd:8a:b0
 2       20:00:00:20:37:fd:9c:f7,22:00:00:20:37:fd:9c:f7
 3       20:00:00:20:37:fd:8d:00,22:00:00:20:37:fd:8d:00

 Please select a Target from the list above ('q' to quit): 0

 LUN   WWULN                                    Vendor
 ----------------
 0     20:00:00:20:37:fd:8b:ab:00:00:00:00:fc:b6:1f:fa SEAGATE
Please select a LUN from the list above ('q' to quit): 0

Index   Initiator
--------------------
 0       iqn.1991-05.com.microsoft:hp-09sd5i4l

 Please select an Initiator to remove ('a' to remove all, 'q' to quit): 0

 All attribute values  that have been changed are saved.
```

Password command

Changes guest and administrator passwords.

Authority

Admin session only to set

Syntax `password`

start (or begin)
end (or stop)
cancel

Example The following is an example of the `password` command:

```
mpx100 (admin) #> passwd

Press 'q' and the Enter key to abort this command.

Select password to change (0=guest, 1=admin): 1
account OLD password                        : ******
account NEW password (6-128 chars)          : ******
please confirm account NEW password         : ******
```

Ping command

Issues a `ping` to a device at a specific IP Address.

Authority Admin session only to set

Syntax `ping`

Quit command

Exits the CLI and returns the operator to the login prompt.

Authority Admin session only to set

Syntax `quit`

Example The following is an example of the `quit` command:

```
mpx100 (admin) #> quit

(none) login:
```

Reboot command

Restarts the mpx100/100b firmware.

Authority Admin session only

Syntax `reboot`

Examples

The following is an example of the `reboot` command:

```
mpx100 (admin) #> reboot

Are you sure you want to reboot the System (y/n): y
System will now be rebooted...
```

Reset command

Restores the mpx100/100b configuration parameters to the factory default values. All LUN mappings are deleted as is all persistent data regarding targets, LUNs, and initiators. The factory default IP addresses is restored.

Authority

Admin session.

Syntax

`reset`

Keywords

`factory`: Restores the mpx100/100b to its factory default configuration.

Examples

The following is an example of the `reset` command:

```
mpx100 (admin) #> reset factory
Are you sure you want to restore to factory default settings (y/n): y
Please reboot the System for the settings to take affect.
```

Save command

Saves logs and traces.

Authority

Admin session only

Syntax

`save`

```
logs
traces
capture
```

Keywords

`logs`: Creates a tar file containing the mpx100/100b log data, storing the file in the mpx100/100b `/var/ftp` directory. The operator must ftp the logs tar file from the mpx100/100b.

`traces`: Creates a tar file containing the mpx100's/100b's dump data, storing the tar file in the mpx100/100b `/var/ftp` directory. The operator must ftp the traces tar file from the mpx100/100b. If the mpx100/100b does not have any dump data, the operator is notified during command execution. An event log entry is generated whenever dump data is generated.

`capture`: Creates a file with all the vital data from the mpx100/100b, including firmware versions and log files.

Examples

The following is an example of the `save logs` command:

```
mpx100 (admin) #> save logs

Save Event Logs completed. Package is mpx100_Evl.tar.gz

Please use FTP to extract the file out from the System.
```

The following are two examples of the `save traces` command:

```
mpx100 (admin) #> save traces
Save ASIC Traces completed. Package is mpx100_Asic_Trace.tar.gz
Please use FTP to extract the file out from the System.

mpx100 (admin) #> save traces

No ASIC trace files exist to save. Command aborted.
```

Set command

Configures general mpx100/100b parameters as well as the parameters for the Fibre Channel, iSCSI, and management ports.

Authority

Admin session only

Syntax

```
set
chap
fc [<port_num>]
features
iscsi [<port_num>]
isns [<port_num>]
mgmt
ntp
properties
system
```

Keywords

`fc [<port_num>]`: Sets FC port parameters.
`features`: Setsfeatures.
`iscsi [<port_num>]`: Sets iSCSI port parameters.
`isns [<port_num>]`: Sets iSNS parameters.
`mgmt`: Sets management port parameters.
`ntp`: Sets NTP parameters.
`properties`: Sets properties.
`system`: Set system parameters.

Examples

The following is an example of the `set` command:

```
mpx100 #>set mgmt
```

Set CHAP command

Configures general mpx100/100b parameters.

Authority Admin session

Syntax `set chap`

Example The following is an example of the `set chap` command:

```
mpx100 (admin) #> set chap
Index (WWNN,WWPN/iSCSI Name)
---- --------------------
0
iqn.2004-08.com.hp.mpx100.0539A01064.0.2000002037fd8bab.
2200002037fd8bab
1
iqn.2004-08.com.hp.mpx100.0539A01064.1.2000002037fd8bab.
2200002037fd8bab
Please select a presented target from the list above ('q' to quit): 0
A list of attributes with formatting and current values will follow.
Enter a new value or simply press the Enter key to accept the current
value. If you wish to terminate this process before reaching the end of
the list press 'q' or 'Q' and the Enter key to do so.
CHAP (0=Enable, 1=Disable) [Disabled]
All attribute values for port 1 that have been changed will now be saved.
```

Set FC command

Configures an FC port.

Authority Admin session

Syntax `set fc [<port_num>]`

Parameters `port_num`: The number of the FC port to be configured.

Examples The following is an example of the `set fc` command:

```
mpx100 (admin) #> set fc
A list of attributes with formatting and current values will follow.
Enter a new value or simply press the Enter key to accept the current value.
If you wish to terminate this process before reaching the end of the list
press 'q' or 'Q' and the Enter key to do so.
WARNING:
The following command might cause a loss of connections to both ports.
Configuring FC Port: 1
----------------------
Link Rate (0=Auto, 1=1Gb, 2=2Gb, 4=4Gb) [Auto ]
Frame Size (0=512B, 1=1024B, 2=2048B) [2048 ]
Execution Throttle (Min=16, Max=256) [64 ]
All attribute values for Port 1 that have been changed will now be saved.
Configuring FC Port: 2
----------------------
Programmed Link Rate (0=Auto, 1=1Gb, 2=2Gb, 4=4Gb) [Auto ]
Frame Size (0=512B, 1=1024B, 2=2048B) [2048 ]
Execution Throttle (Min=16, Max=256) [64 ]
All attribute values for Port 2 that have been changed will now be saved.
```

Set Features command

Adds licenses for the mpx100/100b.

Set iSCSI command

Configures an iSCSI port.

Authority

Admin session

Syntax

`set iscsi [<port_num>]`

Parameters

`port_num`: The number of the iSCSI port to be configured.

Examples

The following is an example of the `set iscsi` command:

```
mpx100 (admin) #> set iscsi
A list of attributes with formatting and current values will follow.
Enter a new value or simply press the Enter key to accept the current value.
If you wish to terminate this process before reaching the end of the list
press 'q' or 'Q' and the Enter key to do so.
WARNING:
The following command might cause a loss of connections to both ports.
Configuring iSCSI Port: 1
----------
Link Rate (0=Auto, 1=10Mb, 2=100Mb, 3=1Gb) [Auto ]
IP Address [0.0.0.0 ]
Subnet Mask [0.0.0.0 ]
Target TCP Port No. (Min=1024, Max=65535) [3260 ]
MTU Size (Min=582B, Max=9000B) [1500 ]
TCP Max Window Size (Min=8192B, Max=32768B) [32768 ]
Header Digests (0=Enable, 1=Disable) [Disabled ]
Data Digests (0=Enable, 1=Disable) [Disabled ]
Window Scaling (0=Enable, 1=Disable) [Disabled ]
BiDi Discovery Chap (0=Enable, 1=Disable) [Disabled ]
Max Burst (Min=512B, Max=262144B) [262144 ]
Max First Burst (Min=512B, Max=32768B) [32768 ]
All attribute values for Port 1 that have been changed will now be saved.

Configuring iSCSI Port: 2
----------
Link Rate (0=Auto, 1=10Mb, 2=100Mb, 3=1Gb) [Auto ]
IP Address [0.0.0.0 ]
Subnet Mask [0.0.0.0 ]
Target TCP Port No. (Min=1024, Max=65535) [3260 ]
MTU Size (Min=582B, Max=9000B) [1500 ]
TCP Max Window Size (Min=8192B, Max=32768B) [32768 ]
Header Digests (0=Enable, 1=Disable) [Disabled ]
Data Digests (0=Enable, 1=Disable) [Disabled ]
Window Scaling (0=Enable, 1=Disable) [Disabled ]
BiDi Discovery Chap (0=Enable, 1=Disable) [Disabled ]
Max Burst (Min=512B, Max=262144B) [262144 ]
Max First Burst (Min=512B, Max=32768B) [32768 ]
All attribute values for Port 2 that have been changed will now be saved.
```

Set iSNS command

Configures iSNS parameters for an iSCSI port.

Authority

Admin session

Syntax

`set isns [<port_num>]`

Parameters

`port_num`: The number of the iSCSI port to be configured for iSNS.

Examples

The following is an example of the `set isns` command:

```
mpx100 (admin) #> set isns
A list of attributes with formatting and current values will follow.
Enter a new value or simply press the Enter key to accept the current value.
If you wish to terminate this process before reaching the end of the list
press 'q' or 'Q' and the Enter key to do so.
Configuring iSNS iSCSI Port: 1
------------------------------
iSNS (0=Enable, 1=Disable) [Disabled ] 0
IP Address [0.0.0.0 ] 10.0.0.3
TCP Port No. [3205 ]
All attribute values for Port 1 that have been changed will now be saved.
Configuring iSNS iSCSI Port: 2
------------------------------
iSNS (0=Enable, 1=Disable) [Disabled ]
All attribute values for Port 2 that have been changed will now be saved.
```

Set MGMT command

Configures the mpx100/100b management port (10/100).

Authority

Admin session

Syntax

`set mgmt`

Parameters

`port_num`: The number of the iSCSI port to be configured for iSNS.

Examples

The following is an example of the `set mgmt` command:

```
mpx100 (admin) #> set mgmt
A list of attributes with formatting and current values will follow.
Enter a new value or simply press the Enter key to accept the current value.
If you wish to terminate this process before reaching the end of the list
press 'q' or 'Q' and the Enter key to do so.
Mode (0=Static, 1=DHCP, 2=Bootp, 3=Rarp) [Dhcp ] 1
IP Address [10.0.0.1 ]
Subnet Mask [255.0.0.0 ]
Gateway [0.0.0.0 ]
All attribute values that have been changed will now be saved.
mpx100 (admin) #> set mgmt
A list of attributes with formatting and current values will follow.
Enter a new value or simply press the Enter key to accept the current value.
If you wish to terminate this process before reaching the end of the list
press 'q' or 'Q' and the Enter key to do so.
Mode (0=Static, 1=DHCP, 2=Bootp, 3=Rarp) [Static ] 1
All attribute values that have been changed will now be saved.
```

Set NTP command

Configures NTP parameters.

Authority Admin session

Syntax `set ntp`

Parameters `port_num`: The number of the iSCSI port to be configured for iSNS.

Examples The following is an example of the `Set NTP` command:

```
mpx100 (admin) #> set ntp
A list of attributes with formatting and current values will follow.
Enter a new value or simply press the Enter key to accept the current value.
If you wish to terminate this process before reaching the end of the list
press 'q' or 'Q' and the Enter key to do so.
NTP (0=Enable, 1=Disable) [Enabled ]
TimeZone Offset from GMT (Min=-12hrs,Max=12hrs) [-8 ]
IP Address [0] [0.0.0.0 ] 207.126.97.57
IP Address [1] [0.0.0.0 ]
IP Address [2] [0.0.0.0 ]
All attribute values that have been changed will now be saved.
```

Set Properties command

Configures both the Inactivity Timer and the CLI Prompt name.

Authority Admin session only

Syntax `set properties`

Examples The following is an example of the `set properties` command:

```
mpx100 (admin) #> set properties

  A list of attributes with formatting and current values will follow.
  Enter a new value or simply press the Enter key to accept the current value.
  If you wish to terminate this process before reaching the end of the list
  press 'q' or 'Q' and the Enter key to do so.

  CLI Inactivty Timer (0=Disable, 1=15min, 2=60min) [15min   ] 1
  CLI Prompt (Max=32 Characters)                    [mpx100  ] mpx100

  All attribute values that have been changed will now be saved.
```

Set SNMP command

Configures the general SNMP properties. Also configures up to eight trap destinations.

Authority Admin session

Syntax `set snmp`

Parameters

`trap_destinations`: The number of the trap destinations to be configured for SNMP.

Examples

The following is an example of the `set snmp` command:

```
mpx100 (admin) #> set snmp
A list of attributes with formatting and current values will follow.
Enter a new value or simply press the Enter key to accept the current value.
If you wish to terminate this process before reaching the end of the list
press 'q' or 'Q' and the Enter key to do so.
Configuring SNMP:
---------------
Read Community                          [          ] Public
Trap Community                          [          ] Private
System Location                         [          ]
System Contact                          [          ]
Authentication Traps (0=Enable, 1=Disable)  [Disabled      ]
All attribute values that have been changed will now be saved.
```

Set System command

Configures the general mpx100/100b parameters.

Authority

Admin session

Syntax

`set system`

Parameters

`port_num`: The number of the iSCSI port to be configured for iSNS.

Examples

The following is an example of the `set system` command:

```
mpx100 (admin) #> set system
A list of attributes with formatting and current values will follow.
Enter a new value or simply press the Enter key to accept the current value.
If you wish to terminate this process before reaching the end of the list
press 'q' or 'Q' and the Enter key to do so.
System Symbolic Name (Max = 64 characters) [ ] testing
Mode (0=Normal, 1=Transparent, 2=Encap_FC) [0 ]
System Log Level (Min = 0, Max = 3) [0 ]
All attribute values that have been changed will now be saved.
```

Set VLAN command

See the `set iscsi` command.

Show command

Displays mpx100/100b operational information.

Authority

Admin session only to set

Syntax

`show [keyword]`

Keywords

```
chap
features
mpx100
fc [<port_num>]
initiators fc or iscsi
initiators_LUNmask
iscsi [<port_num>]
isns [<port_num>]
logs [<entries>]
luninfo
LUNs
LUNmask
mgmt
ntp
perf
presented_targets fc or iscsi
properties
stats
system
targets fc or iscsi
```

Examples

The following is an example of the `show` command:

```
mpx100 #> show mpx100

mpx100 Information
------------------
Product Name            mpx100
Symbolic Name           Rack3
mpx100 Mode             iSCSI Server Connectivity Mode
Serial Number           0539A01070
HW Version              2
SW Version              1.0.5.0
No. of FC Ports         2
No. of iSCSI Ports      2
Log Level               0
Log Length (KB)         32768
Temperature (C)         32
```

Show Chap command

Displays the iSCSI nodes that have been configured with CHAP enabled.

Authority

None

Syntax

```
show chap
```

Examples The following is an example of the `show chap` command:

```
mpx100 #> show chap

  The following is a list of iSCSI nodes that have been configured
  with CHAP 'ENABLED':

  Type      iSCSI Node
  -------  ----------
  Init      iqn.1998-01.com.vmware:rack86-s09-1ac2c0e4
  Init      iqn.1998-01.com.vmware:rack86-s02-39ae5fb4
```

Show Features command

Displays license information for the mpx100/100b.

Show Logs Command

Displays the latest entries in the mpx100/100b system log file.

Authority None

Syntax `show logs [<entries>]`

Parameters *entries*

Examples The following is an example of the `show logs` command:

```
mpx100 #> show logs 5
03/28/2008 13:15:41 BridgeApp 3 QLIS_OpenConnectionNotification:
Target connection opened (Port 1 DDB 2)
03/28/2008 13:15:43 BridgeApp 3 QLIS_OpenConnectionNotification:
Target connection opened (Port 1 DDB 2)
03/28/2008 13:15:44 BridgeApp 3 QLIS_OpenConnectionNotification:
Target connection opened (Port 1 DDB 2)
03/28/2008 13:15:45 BridgeApp 3 QLIS_OpenConnectionNotification:
Target connection opened (Port 0 DDB 2) 03/28/2008 13:15:45 BridgeApp 3
QLIS_OpenConnectionNotification:
Target connection opened (Port 0 DDB 2)
```

Show LUNinfo command

Displays information about the LUN

Show Perf command

Displays performance numbers for the iSCSI GE and FC ports.

Authority None

Syntax `show perf`

Examples

The following is an example of the `show perf` command:

```
mpx100 #> show perf

  WARNING: Valid data is only displayed for port(s) that are not
           associated with any configured FCIP routes.

  Port    Bytes/s   Bytes/s   Bytes/s   Bytes/s   Bytes/s
  Number  (init_r)  (init_w)  (tgt_r)   (tgt_w)   (total)
  ------  --------  --------  --------  --------  --------
  GE1     0         0         0         27K       27K
  GE2     0         0         0         0         0
  FC1     0         0         0         0         0
  FC2     0         27K       0         0         27K
```

Show Properties command

Displays the values of both the Inactivity Timer and the CLI Prompt name.

Authority

None

Syntax

`show properties`

Examples

The following is an example of the `show properties` command:

```
mpx100 #> show properties

  CLI Properties
  --------------
  Inactivty Timer   15 minutes
  Prompt String     mpx100
```

Show System command

Displays the mpx100/100b product information, including serial number, software and hardware versions, configuration, and temperature.

Authority

None

Syntax

`show system`

Examples The following is an example of the `show system` command:

```
mpx100 #> show system
System Information
------------------
Product Name              HP StorageWorks  mpx100
Symbolic Name             Rack3
System Mode               iSCSI Server Connectivity Mode
Serial Number             0539A01070
HW Version                 2
SW Version                1.0.5.0
No. of FC Ports            2
No. of iSCSI Ports         2
Log Level                  0
Log Length (KB)            32768
Temperature (c)           32
```

Show MGMT command

Displays management information for the mpx100/100b.

Authority None

Syntax `show mgmt`

Examples The following is an example of the `show mgmt` command:

```
mpx100 #> show mgmt
Management Port Information
---------------------------
Mode              Dhcp
Link Status       Up
IP Address        172.17.137.210
Subnet mask       255.255.254.0
Gateway           172.17.136.1
MAC Address       00-c0-dd-0c-60-10
```

Show iSCSI command

Displays iSCSI information for the specified port. If the port is not specified, both ports are displayed.

Authority None

Syntax `show iscsi [<port_num>]`

Parameters `port_num`: The number of the iSCSI port to be displayed.

Examples

The following is an example of the `show iscsi` command:

```
iSCSI Port Information
----------------------
iSCSI Port                1
  Port Status             Enabled
  Link Status             Up
  iSCSI Base Name         iqn.1986-03.com.hp:fcgw.mpx100:mpx100-74.0
  MAC Address             00-c0-dd-0c-8d-c2
  IP Address              33.33.66.73
  Subnet Mask             255.255.0.0
  Gateway IP Address      0.0.0.0
  Firmware Revision No.   3.00.02.44
  No. of Open Connections 0
  Target TCP Port No.     3260
  MTU Size                Jumbo
  Window Size             32768
  Window Scaling          Disabled
  Current Port Speed      1Gb/FDX
  Programmed Port Speed   Auto
  Header Digests          Disabled
  Data Digests            Disabled
  Max Burst               262144
  Max First Burst         65536
  VLAN                    Disabled
```

Show FC command

Displays FC port information for the specified port. If the port is not specified, both ports are displayed.

Authority

None

Syntax

`show fc [<port_num>]`

Parameters

`port_num`: The number of the FC port to be displayed.

Examples

The following is an example of the `show fc` command:

```
mpx100 #> show fc 1
FC Port Information
-------------------
FC Port 1
Link Status Down
Current Link Rate Unknown
Programmed Link Rate Auto
WWNN                          20:00:00:c0:dd:0c:60:11
WWPN                          21:00:00:c0:dd:0c:60:11
Port ID                       00-00-00
Firmware Revision No.         3.03.07
Frame Size                    2048
Execution Throttle            64
Connection Mode               Unknown
Programmed Connection Option  Loop Preferred
```

Show Initiators command

Displays SCSI Initiator information for iSCSI and/or FC.

Authority None

Syntax

```
show initiators
fc
iscsi
```

Keywords

`fc`: Specifies the display of FC initiators.

`iscsi`: Specifies the display of iSCSI Initiators.

Examples The following is an example of the `show initiators` command:

```
mpx100 #> show initiators

Initiator Information
---------------------
Initiator Name   iqn.1991-05.com.microsoft:hp-8qdaqlxt
Alias
IP Address       10.3.5.130
Portal No.       1
Status            Logged In
OS Type           MS Windows
CHAP              Disabled
```

Show Initiators LUN Mask command

Displays initiators and the LUNs that are mapped to them.

Authority None

Syntax

```
show initiators_LUNmask
```

Examples The following is an example of the `show initiators_LUNmask` command:

```
mpx100 #> show initiators_LUNmask

Index   (WWNN/iSCSI Name)
---------------------
0       iqn.1991-05.com.microsoft:hp-8qdaqlxt

Please select an Initiator from the list above ('q' to quit): 0

LUN Number       WWULN
-------------------------------
0           50:00:1f:e1:50:01:11:50:00:00:00:00:00:00:00:00
1           60:05:08:b4:00:01:1f:60:00:1d:40:00:00:9a:00:00
2           60:05:08:b4:00:01:1f:60:00:1d:40:00:00:9f:00:00
3           60:05:08:b4:00:01:1f:60:00:1d:40:00:00:a2:00:00
4           60:05:08:b4:00:01:1f:60:00:1d:40:00:00:a5:00:00
5           60:05:08:b4:00:01:1f:60:00:1d:40:00:00:a8:00:00
6           60:05:08:b4:00:01:1f:60:00:1d:40:00:00:ab:00:00
7           60:05:08:b4:00:01:1f:60:00:1d:40:00:00:ae:00:00
8           60:05:08:b4:00:01:1f:60:00:1d:40:00:00:bb:00:00
```

Show iSNS command

Displays iSNS configuration information for the specified iSCSI port. If the port is not specified, the iSNS configuration information for both iSCSI ports is displayed.

Authority None

Syntax `show isns [<port num>]`

Parameters `port_num`: The iSCSI port number whose iSNS configuration is to be displayed.

Examples The following is an example of the `Show iSNS` command:

```
mpx100 #> show isns

iSNS Information
----------------
iSCSI Port      1
iSNS            Disabled
IP Address      0.0.0.0
TCP Port No.    3205

iSCSI Port      2
iSNS            Disabled
IP Address      0.0.0.0
TCP Port No.    3205
```

Show LUNs command

Displays LUN information for each target.

Authority None

Syntax `show luns`

Examples

The following is an example of the `show luns` command:

```
mpx100 #> show LUNs

LUN Information
---------------

Target   50:00:1f:e1:50:01:11:50,50:00:1f:e1:50:01:11:58
-------------------------------------------------------
WWULN          50:00:1f:e1:50:01:11:50:00:00:00:00:00:00:00:00
LUN Number     0
VendorId       COMPAQ
ProductId      HSV110 (C)COMPAQ
ProdRevLevel   3010
Portal          0
LUN Size        0 MB
LUN State       Online

WWULN          60:05:08:b4:00:01:1f:60:00:1d:40:00:00:9a:00:00
LUN Number     1
VendorId       COMPAQ
ProductId      HSV110 (C)COMPAQ
ProdRevLevel   2001
Portal          0
LUN Size        10239 MB
LUN State       Online

WWULN          60:05:08:b4:00:01:1f:60:00:1d:40:00:00:9f:00:00
LUN Number     2
VendorId       COMPAQ
ProductId      HSV110 (C)COMPAQ
ProdRevLevel   2001
Portal          0
LUN Size        10239 MB
LUN State       Online

Target   50:00:1f:e1:50:06:9d:20,50:00:1f:e1:50:06:9d:2c
-------------------------------------------------------
WWULN          50:00:1f:e1:50:06:9d:20:01:14:00:04:00:00:00:03
LUN Number     0
VendorId       HP
ProductId      HSV200
ProdRevLevel   5020
Portal          0
LUN Size        0 MB
LUN State       Online
```

Show LUN Mask command

Displays LUN mappings.

Authority

None

Syntax

```
show lunmask
```

Examples

The following is an example of the `show lunmask` command:

```
mpx100 #> show LUNmask

Index   (WWNN,WWPN/iSCSI Name)
-----------------------
0       50:00:1f:e1:50:01:11:50,50:00:1f:e1:50:01:11:58
1       50:00:1f:e1:50:06:9d:20,50:00:1f:e1:50:06:9d:2c

Please select a Target from the list above ('q' to quit): 0

LUN   WWULN                                          Vendor
-------------------
0     50:00:1f:e1:50:01:11:50:00:00:00:00:00:00:00:00 COMPAQ
1     60:05:08:b4:00:01:1f:60:00:1d:40:00:00:9a:00:00 COMPAQ
2     60:05:08:b4:00:01:1f:60:00:1d:40:00:00:9f:00:00 COMPAQ
3     60:05:08:b4:00:01:1f:60:00:1d:40:00:00:a2:00:00 COMPAQ
4     60:05:08:b4:00:01:1f:60:00:1d:40:00:00:a5:00:00 COMPAQ
5     60:05:08:b4:00:01:1f:60:00:1d:40:00:00:a8:00:00 COMPAQ
6     60:05:08:b4:00:01:1f:60:00:1d:40:00:00:ab:00:00 COMPAQ
7     60:05:08:b4:00:01:1f:60:00:1d:40:00:00:ae:00:00 COMPAQ
8     60:05:08:b4:00:01:1f:60:00:1d:40:00:00:bb:00:00 COMPAQ

Please select a LUN from the list above ('q' to quit): 1

Target  50:00:1f:e1:50:01:11:50,50:00:1f:e1:50:01:11:58
LUN     Initiator
-----------------
1       iqn.1991-05.com.microsoft:hp-8qdaqlxt
```

Show NTP command

Displays LUN mappings.

Authority

None

Syntax

`show ntp`

Examples

The following is an example of the `show ntp` command:

```
mpx100 #> show ntp

NTP Information
---------------
Mode                        Disabled
Status                      Offline
TimeZone Offset (Hours)     0
```

Show Presented Targets command

Displays targets presented by the mpx100/100b, either FC and/or iSCSI.

Authority

None

Syntax

```
show presented_targets
fc
iscsi
```

Keywords

`fc`: Specifies the display of FC-presented targets.

`iscsi`: Specifies the display of iSCSI-presented targets.

Examples

The following is an example of the `show presented targets FC` command:

```
mpx100 #> show presented_targets fc

No Presented Targets found.
```

The following is an example of the `Show Presented Targets iSCSI` command:

```
mpx100 #> show presented_targets iscsi

Presented Target Information
----------------------------

iSCSI Presented Targets
-----------------------
Name     iqn.2000-04.com.hp:mpx100:0.50001fe150069d20.50001fe150069d2c
IP       10.3.5.66
CHAP     Disabled

WWNN     50:00:1f:e1:50:06:9d:20
WWPN     50:00:1f:e1:50:06:9d:2c

Name     iqn.2000-04.com.hp:mpx100:1.50001fe150069d20.50001fe150069d2c
IP       10.3.5.67
CHAP     Disabled

WWNN     50:00:1f:e1:50:06:9d:20
WWPN     50:00:1f:e1:50:06:9d:2c

Name     iqn.2000-04.com.hp:mpx100:0.50001fe150011150.50001fe150011158
IP       10.3.5.66
CHAP     Disabled

WWNN     50:00:1f:e1:50:01:11:50
WWPN     50:00:1f:e1:50:01:11:58

Name     iqn.2000-04.com.hp:mpx100:1.50001fe150011150.50001fe150011158
IP       10.3.5.67
CHAP     Disabled

WWNN     50:00:1f:e1:50:01:11:50
WWPN     50:00:1f:e1:50:01:11:58
```

Show SNMP command

Displays the router's SNMP properties and any traps that have been configured.

Authority

None

Syntax `show snmp`

Examples The following is an example of the `show snmp` command:

```
mpx100 #> show snmp

SNMP configuration
------------------------
Read Community          Public
Trap Community          Private
System Location
System Contact
Authentication traps
System OID               1.3.6.1.4.1.3873.1.4
System Description      HP StorageWorks mpx100

Trap Destination        1
IP Address               10.0.0.5
Trap Port                1024
Trap Version            2
```

Show Stats command

Displays the mpx100/100b for statistics, FC and iSCSI.

Authority None

Syntax `show stats`

Examples

The following is an example of the `show stats` command:

```
mpx100 #> show stats

FC Port Statistics
------------------
FC Port                          1
Interrupt Count                  23
Target Command Count             0
Initiator Command Count          0

FC Port                          2
Interrupt Count                  1717443350
Target Command Count             0
Initiator Command Count          1815115822

iSCSI Port Statistics
---------------------
iSCSI Port                       1
Interrupt Count                  3108358287
Target Command Count             1815115673
Initiator Command Count          0
MAC Xmit Frames                  54392137663
MAC Xmit Byte Count              61199467593726
MAC Xmit Multicast Frames        0
MAC Xmit Broadcast Frames        0
MAC Xmit Pause Frames            0
MAC Xmit Control Frames          0
MAC Xmit Deferrals               0
MAC Xmit Late Collisions         0
MAC Xmit Aborted                 0
MAC Xmit Single Collisions       0
MAC Xmit Multiple Collisions     0
MAC Xmit Collisions              0
MAC Xmit Dropped Frames          0
MAC Xmit Jumbo Frames            0
MAC Rcvd Frames                  42061498217
MAC Rcvd Byte Count              60362392962831
MAC Rcvd Unknown Control Frames  0
MAC Rcvd Pause Frames            0
MAC Rcvd Control Frames          0
MAC Rcvd Dribbles                0
MAC Rcvd Frame Length Errors     0
MAC Rcvd Jabbers                 0
MAC Rcvd Carrier Sense Errors    0
MAC Rcvd Dropped Frames          0
MAC Rcvd CRC Errors              0
MAC Rcvd Encoding Errors         0
MAC Rcvd Length Errors Large     1
MAC Rcvd Small Errors Small      0
MAC Rcvd Multicast Frames        34394
MAC Rcvd Broadcast Frames        33144
```

Examples (continued)

```
iSCSI Port                          2
Interrupt Count                     51604
Target Command Count                0
Initiator Command Count             0
MAC Xmit Frames                     0
MAC Xmit Byte Count                 0
MAC Xmit Multicast Frames           0
MAC Xmit Broadcast Frames           0
MAC Xmit Pause Frames               0
MAC Xmit Control Frames             0
MAC Xmit Deferrals                  0
MAC Xmit Late Collisions            0
MAC Xmit Aborted                    0
MAC Xmit Single Collisions          0
MAC Xmit Multiple Collisions        0
MAC Xmit Collisions                 0
MAC Xmit Dropped Frames             0
MAC Xmit Jumbo Frames               0
MAC Rcvd Frames                     186
MAC Rcvd Byte Count                 39260
MAC Rcvd Unknown Control Frames     0
MAC Rcvd Pause Frames               0
MAC Rcvd Control Frames             0
MAC Rcvd Dribbles                   0
MAC Rcvd Frame Length Errors        0
MAC Rcvd Jabbers                    0
MAC Rcvd Carrier Sense Errors       0
MAC Rcvd Dropped Frames             0
MAC Rcvd CRC Errors                 0
MAC Rcvd Encoding Errors            0
MAC Rcvd Length Errors Large        0
MAC Rcvd Small Errors Small         0
MAC Rcvd Multicast Frames           94
MAC Rcvd Broadcast Frames           91
```

Examples (continued)

```
iSCSI Shared Statistics
-----------------------
PDUs Xmited                     2729500577
Data Bytes Xmited               55036896842234
PDUs Rcvd                       2655246170
Data Bytes Rcvd                 0
I/O Completed                   1815115669
Unexpected I/O Rcvd             0
iSCSI Format Errors             0
Header Digest Errors            0
Data Digest Errors              0
Sequence Errors                 0
PDU Xmit Count                  2729500577
PDU Xmit Count                  2729500577
PDU Xmit Count                  2729500577
IP Xmit Packets                 54392134283
IP Xmit Byte Count              59132566295008
IP Xmit Fragments               0
IP Rcvd Packets                 42061430681
IP Rcvd Byte Count              58764046068744
IP Rcvd Fragments               0
IP Datagram Reassembly Count    0
IP Error Packets                0
IP Fragment Rcvd Overlap        0
IP Fragment Rcvd Out of Order   0
IP Datagram Reassembly Timeouts 0
TCP Xmit Segment Count          54392134284
TCP Xmit Byte Count             57389353022514
TCP Rcvd Segment Count          42061430681
TCP Rcvd Byte Count             57418079800284
TCP Persist Timer Expirations   0
TCP Rxmit Timer Expired         116
TCP Rcvd Duplicate Acks         986657165
TCP Rcvd Pure Acks              816265831
TCP Xmit Delayed Acks           3584507
TCP Rcvd Pure Acks              177811024
TCP Rcvd Segment Errors         0
TCP Rcvd Segment Out of Order   1
TCP Rcvd Window Probes          0
TCP Rcvd Window Updates         18500272
TCP ECC Error Corrections       0
```

Show Targets command

Displays targets discovered by the mpx100/100b, FC, and/or iSCSI.

Authority

None

Syntax

```
show targets
fc
iscsi
```

Keywords

`fc`: Specifies the display of FC targets

`iscsi`: Specifies the display of iSCSI targets.

Examples

The following is an example of the `show targets fc` command:

```
mpx100 #> show targets fc

Target Information
------------------
WWNN        50:00:1f:e1:50:01:11:50
WWPN        50:00:1f:e1:50:01:11:58
Port ID      01-0d-00
Portal No.  1
State       Online

WWNN        50:00:1f:e1:50:06:9d:20
WWPN        50:00:1f:e1:50:06:9d:2c
Port ID      01-08-00
Portal No.  1
State       Online
```

The following is an example of the `Show Targets iSCSI` command:

```
mpx100 #> show targets iscsi

No Targets found.
```

Show VLAN command

See the `show iscsi` command.

Target command

Removes targets from the mpx100/100b database. This command is typically used to remove targets that are no longer connected to the mpx100/100b from its database.

Authority

Admin session only to set.

Syntax

`target`

Keywords

`add`

`rm`

Examples

The following is an example of the `target` command:

```
mpx100 (admin) #> target rm

Index   (WWNN,WWPN/iSCSI Name)
------------------------------
0       20:00:00:20:37:fd:8b:ab:00:00:00:00:fc:b6:1f:fa

Please select an 'OFFLINE' Target from the list above ('q' to quit): q
Command aborted.
```

B Diagnostics and troubleshooting

Diagnostic information about the mpx100/100b is available through the chassis LEDs and the port LEDs. Diagnostic information is also available through the HP StorageWorks mpx Manager and CLI event logs and error displays. This section describes the following types of diagnostics:

- Chassis diagnostics, page 173
- Troubleshooting LUN presentation from the EVA to the iSCSI initiator, page 176

Chassis diagnostics

Chassis diagnostics are indicated by the chassis LEDs shown in Figure 72.

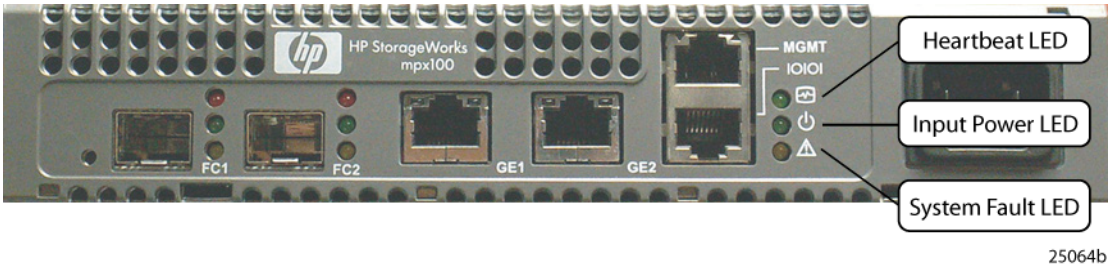


Figure 72 Chassis LEDs

1. Heartbeat LED
2. Input Power LED
3. System Fault LED

Input Power LED is extinguished

The Input Power LED is illuminated when the mpx100/100b logic circuitry is receiving proper voltages. If the Input Power LED is not illuminated:

1. Inspect power cord and connectors. Is the cord unplugged? Is the cord or connector damaged?
   - If yes, make necessary corrections or repairs. If the condition remains, continue with the next step.
   - If not, continue with the next step.
2. Inspect AC power source. Is the power source delivering the proper voltage?
   - If yes, continue with the next step.
   - If not, make the necessary repairs. If the condition remains, continue with the next step.
3. Replace the mpx100/100b.

System Alert LED is illuminated

The System Fault LED is illuminated when a fault exists in the mpx100/100b firmware or hardware. If the System Fault LED is illuminated, check the Heartbeat LED for an error blink pattern and take necessary actions. See "Heartbeat LED blink patterns" on page 174 for more information.

Power-on self-test diagnostics

The mpx100/100b performs a series of tests as part of its power-on procedure. The POST diagnostic program performs the following tests:

- Memory
- FLASH validation
- PCI device discovery
- Management Ethernet port

Heartbeat LED blink patterns

The Heartbeat LED indicates the operational status of the mpx100/100b. When the POST completes with no errors, the Heartbeat LED blinks at a steady rate of once per second. When the mpx100/100b is in maintenance mode, the Heartbeat LED illuminates continuously. The blink patterns that indicate critical errors are described in the following sections. In addition to producing a Heartbeat error blink pattern, a critical error also illuminates the System Fault LED.

The Heartbeat LED shows an error blink pattern for the following conditions:

- 1 blink—Normal operation
- 2 blinks—Not used
- 3 blinks—System error
- 4 blinks—Management port IP address conflict
- 5 blinks—Over temperature

Normal heartbeat blink pattern

A blink pattern of one second ON followed by one second OFF indicates that the mpx100/100b is operating normally (see Figure 73).

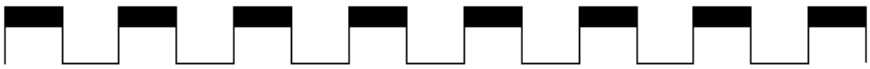


Figure 73 Normal heartbeat blink pattern

System error blink pattern

A system error is indicated with a three-blink pattern (see Figure 74).

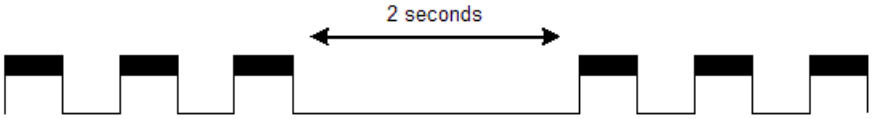


Figure 74 System error blink pattern

Management port IP address conflict blink pattern

An IP address conflict on the management Ethernet port is indicated with a four-blink pattern (see Figure 75).

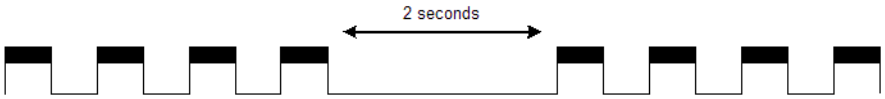


Figure 75 Port IP address conflict blink pattern

Using the CLI or GUI, the IP address conflict blink pattern may be cleared using the Beacon OFF function.

Over-temperature blink pattern

An mpx100/100b over-temperature condition is indicated with a five-blink pattern followed by a two-second pause. The five-blink error pattern indicates that the air temperature inside the mpx100/100b has exceeded the failure temperature threshold at 70 °C (see Figure 76).

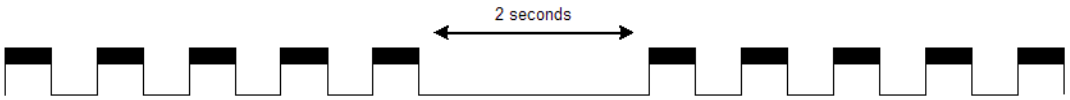


Figure 76 Over-temperature blink pattern

If the Heartbeat LED shows the over-temperature blink pattern, do the following:

1. Inspect the chassis air vents. Are the intake and exhaust vents clear?
   - If yes, continue with the next step
   - If not, remove any debris from the fan intake and exhaust. If the condition remains, continue with the next step.
2. Consider the ambient air temperature near the mpx100/100b and clearance around the mpx100/100b. Make necessary corrections.
3. If the condition persists, power down the mpx100/100b. Contact your authorized maintenance provider.

mpx100/100b log data

The mpx100/100b maintains a message log that can be displayed through the CLI or the mpx Manager GUI. The message log is persistent up to 256 MB of log entries and is maintained across the mpx100/100b power cycles and reboots.

The three log message categories are:

- Informational
- Error
- Fatal

See “Log data” on page 179 for more information.

The mpx100/100b statistics

Statistics are available from the mpx100/100b for the Fibre Channel and iSCSI ports, and can be displayed through the CLI or the mpx Manager GUI. See "Show Stats command" on page 168.

Troubleshooting LUN presentation from the EVA to the iSCSI Initiator

This section describes basic troubleshooting when presenting a LUN from the EVA to the iSCSI Initiator. In this process it is important to focus on the EVA port and the LUN because they must be presented throughout the Fibre Channel and IP networks to the iSCSI Initiator.

Presenting an EVA LUN to an iSCSI Initiator is a two-step process in HP Command View:

1. Presenting the LUN to the iSCSI host entry. This communication presents the LUN from the EVA FC ports to the mpx100/100b FC ports.
2. Presenting the LUN to the iSCSI Initiator. This communication presents the LUN from the mpx100/100b Gigabit Ethernet ports to the iSCSI Initiator.

Troubleshooting EVA communication with the mpx100/100b

If there is a problem with HP Command View EVA communicating with the mpx100/100b or not discovering LUNs, verify that:

- The mpx100/100b is powered on.
- The mpx100/100b management port is cabled to the IP network.
- The mpx100/100b management port IP address, subnet mask, and gateway are set properly.
- The HP Command View application server NIC IP address, subnet mask, and gateway are set properly.
- The mpx100/100b management port is on the same IP network as the HP Command View EVA application server.
- The iSCSI controller's management port connection status is online in HP Command View EVA.

Troubleshooting EVA or LUN FC port connections

If the mpx100/100b does not see EVA ports or LUNs connected to the FC ports:

- Verify that the mpx100/100b is powered on.
- Verify that the Fibre Channel link light is green.
- If your configuration is fabric connect mode, check to see if the mpx100/100b FC ports are zoned with the EVA FC ports.
- If your configuration is direct connect mode, check to see if EVA ports connected to the mpx100/100b FC ports are set to direct connect.
- Verify that the EVA ports and LUNs are discovered and online to the mpx100/100b are using the mpx Manager GUI or CLI.
- In HP Command View EVA , verify that the Vdisk is uses FC ports to present the Vdisk to the iSCSI host entry.

Troubleshooting iSCSI Initiator connections to the EVA iSCSI targets

If the iSCSI Initiator cannot connect to the EVA iSCSI targets presented by the mpx100/100b:

- For a Windows Initiator:
  - Verify that the iSCSI driver is installed.
  - Ping the mpx100/100b iSCSI port from the iSCSI Initiator.
  - Select **General > Secret** and check the security setting on the initiator.
  - Verify that the iSCSI Initiator's `iqn` name changed in the General tab.
  - Verify that the iSCSI Port IP address is added to Target Portals on the Discovery tab.
  - Verify that the iSCSI Target status is connected on the Targets tab.
- For a Linux Initiator:
  - Verify that the iSCSI driver is installed.
  - Ping the mpx100/100b iSCSI Port from the iSCSI Initiator.
  - Check for security settings, if any, in authentication settings in the `/etc/iscsi.conf` file.
  - Verify that the iSCSI IP port address is added to the Discovery Address setting in `/etc/iscsi.conf` file.
  - Verify that the iSCSI Target name is added to the TargetName setting in the `/etc/iscsi.conf` file.
  - Verify that the iSCSI Target status is connected with the command `iscsi-ls -l`.
- For a Macintosh Initiator:
  - Verify that the iSCSI driver is installed.
  - Ping the mpx100/100b iSCSI port from the iSCSI Initiator.
  - Verify that the target's Visible field is set to Yes in the Manager Targets screen.
  - Verify that the target's status in the Target Status field is connected.
- For an OpenVMS Initiator:
  - Verify that TCP/IP has been started and is properly configured.
  - Verify that the initiator has been loaded and that the device DEA0 exists.
  - Ping the mpx100/100b iSCSI ports from the OpenVMS host.
  - Make sure the iSCSI ports and iSNS server (if applicable) have been defined in the TCP/IP host database.
- On the mpx100/100b:
  - Verify that the mpx100/100b iSCSI port's IP address and subnet mask are set properly.
  - Verify that the mpx100/100b iSCSI port is in the same LAN as the iSCSI Initiator.
  - Check the iSCSI port CHAP settings (if any).

iSCSI Initiator, EVA iSCSI target, and EVA LUN connections

If the iSCSI Initiator connects to the EVA iSCSI target but does not see any EVA LUNs, check the following:

- Check in HP Command View EVA to verify that a LUN iSCSI is presented to the iSCSI Initiator.
- Using mpx Manager or the CLI, verify that the mpx100/100b has the LUN assigned to the initiator.
- Check the iSCSI Initiator's `iqn` name syntax.

If the `iqn` name has changed, choose from one of the following options to reinstate the original `iqn` name:

- For Windows—In the initiator GUI, click the **General** tab, and then select **Change > Reset** to reset it to the original `iqn` name.
- For Linux—Edit the InitiatorName setting in the `/etc/initiatorname.iscsi` file.
- For Linux and Windows—Reinstall the initiator to create a valid `iqn` name.
- For OpenVMS—Ensure that the TCP/IP host name has not changed. If it has changed, it needs to be changed back and the initiator needs to be restarted, or the LUNs need to be re-presented using the new `iqn` name.

- Rescan the disks:
  - For Windows, select Disk Management.
  - For Linux, issue the `/etc/rc.d/init.d/iscsi restart` command.
  - For OpenVMS, issue the `mcr sysman io autoconfigure /log` command.
- Reboot the iSCSI Initiator.

HP Command View EVA refresh

The HP Command View EVA user interface periodically performs an automatic refresh to ensure that the user interface accurately reflects the state of the array. However, the automatic refresh may interfere with your work when you are completing the fields on the iSCSI controller properties window. Specifically, while you are entering information, an automatic refresh may occur and reset the fields, causing you to lose the data you have entered.

To ensure that you retain iSCSI controller property field information in HP Command View EVA, do one of the following:

- Enter a portion of the data between page refreshes, and then click **Save** to store the information. Enter the rest of the data and then click **Save**.
- Change the refresh interval for the entire GUI to a larger value in **Agent Options > User Interface**. The default value for the content pane is 60 seconds.

C Log data

The mpx100/100b maintains a message log that can be displayed and retrieved by the operator, either through the CLI or the SANsurfer GUI. The message log is persistent in that it is maintained across the mpx100/100b power cycles and reboots. The three log message categories are:

- Informational log messages, page 179
- Error log messages, page 181
- Fatal log messages, page 191

The following sections describe the log message categories.

Informational log messages

The following sections list the informational log messages and the definitions of the messages, by category.

Application modules

The informational log messages provided by application modules are listed in Table 21.

Table 21 Application modules—informational log messages

ID	Log message	Message Number	Description
53254	System Booting Up.	6	Router is booting up.
53358	QLBA_RemoveTargetNodeObject : TargetNode %s	110	User removed a target (iSR6140 or iSR6142) or a target presentation (iSR6142).
54274	QLFC_Login: Origin 0x%x, VP Index 0x%x, Id 0x%x	1026	FC login occurred, origin xx (1 = HBA, 2 = Target, 3 = Initiator), VP (virtual port) xx, Id (Loop ID) xx.
54275	QLFC_Login: Port ID %.2x%.2x%.2x	1027	FC login occurred with port ID xx.xx.xx.
54276	QLFC_Login: Node Name %.2x%.2x%.2x%.2x%.2x%.2x%.2x%.2x	1028	FC login occurred with WWNN xx.xx.xx.xx.xx.xx.xx.xx.
54277	QLFC_Login: Port Name %.2x%.2x%.2x%.2x%.2x%.2x%.2x%.2x	1029	FC login occurred with WWPN xx.xx.xx.xx.xx.xx.xx.xx.
54359	QLFC_HandleTeb: FC Login. VP 0x%x	1111	FC login event notification, VP (virtual port) xx.
54579	QLIS_CloseSession: Initiator Logged out	1331	An iSCSI initiator logged out of a router presented target.

ID	Log message	Message Number	Description
54683	QLIS_OpenConnectionNotification: Target connection opened (Port %d, DDB %d)	1435	An iSCSI initiator logged into a router presented target.
54938	QLIS_HandleTeb: UTM_EC_OPEN_CONNECTION	1690	Event notification: iSCSI open connection request.
54939	QLIS_HandleTeb: UTM_EC_CLOSE_CONNECTION or UTM_EC_CONNECTION_CLOSED	1691	Event notification: iSCSI close connection request or connection closed.
54940	QLIS_HandleTeb: UTM_EC_CONNECTION_OPENED	1692	Event notification: iSCSI connection opened
54941	QLIS_HandleTeb:iSNS Server Open Connection succeeded	1693	Event notification: connection opened with iSNS server.
54943	QLIS_HandleTeb: UTM_EC_ISNS_SCN	1695	Event notification: iSNS SCN received.
54945	QLIS_HandleTeb: UTM_EC_ISNS_CLIENT_DISCOVERED	1697	Event notification: iSNS client discovered.

iSCSI driver

The following log messages are common to both iSCSI ports, 1 (GE1) and 2 (GE2). They are listed in Table 22 and described in this section. Log messages beginning with #0 apply to iSCSI port 1 (GE1), and log messages beginning with #1 apply to iSCSI port 2 (GE2).

Table 22 SCSI driver—informational log messages

ID	Log message	Message Number	Description
86343	#%d: QLPortUp: Set link configuration 0x%x	327	iSCSI port enabled, port up.
86347	#%d: QLDisable: Restart RISC	331	Restart iSCSI processor (RISC).
86349	#%d: QLEnable: Restart RISC to update EEPROM	333	EEPROM updated, restart iSCSI processor (RISC).
86352	#%d: QLPortDown: Set link configuration 0x%x	336	iSCSI port disabled, port down.
86874	#%d: QLIsrDecodeMailbox: Link up	858	Linkup reported by iSCSI processor for GE1 or GE2.
87346	#%d: QLGetFwStateCallback: link 100Mb FDX	1330	iSCSI port link-up at 100Mb full-duplex
87347	#%d: QLGetFwStateCallback: link 100Mb HDX	1331	iSCSI port link-up at 100Mb half-duplex
87348	#%d: QLGetFwStateCallback: link 1000Mb FDX	1332	iSCSI port link-up at 1000Mb full-duplex
87349	#%d: QLGetFwStateCallback: link 1000Mb HDX	1333	iSCSI port link-up at 1000Mb half-duplex

ID	Log message	Message Number	Description
87350	#%d: QLGetFwStateCallback: Invalid link speed 0x%x	1334	iSCSI port link speed could not be determined. Link speed may be incorrectly programmed.

Fibre Channel driver

The informational log messages for the Fibre Channel driver are common to both FC ports 1 (FC1) and 2 (FC2). The messages are listed and described in Table 23. Log messages beginning with #0 apply to FC port 1 (FC1) and log messages beginning with #1 apply to FC port 2 (FC2).

Table 23 FC driver—informational log messages

ID	Log message	Message Number	Description
118882	#%d: QLIoctlDisable: Reset adapter	98	Request to reset the FC processor (adapter) received from IOCTL interface.
119088	#%d: QLIsrEventHandler: LIP occurred (%x): mailbox1 = %x	304	Fibre Channel LIP (loop initialization procedure) occurred. LIP type is reported, as are the contents of the FC processor mailbox 1 register.
119089	#%d: QLIsrEventHandler: LIP reset occurred (%x): mailbox1 = %x	305	Fibre Channel LIP Reset occurred. LIP reset type is reported, as are the contents of the FC processor mailbox 1 register.
119090	#%d: QLIsrEventHandler: Link up (%x) mailbox1 = %x	306	Fibre Channel Link Up occurred. Event status is reported, as are the contents of the FC processor mailbox 1 register.
119092	#%d: QLIsrEventHandler: Link mode up (%x): RunTimeMode=%x	308	Event reporting that the Fibre Channel link is up, and the mode it is operating in (point-to-point or loop). Event status is reported, as is the RunTimeMode, which indicates the mode (0 = loop, 1 = point-to-point).
119093	#%d: QLIsrEventHandler: RSCN update (%x) rscnInfo: %x	309	Event reporting that an RSCN was received. Event status is reported, as is the RSCN information.
119097	#%d: QLIsrEventHandler: Port update (%x) mb1-3 %x %x %x	313	Event reporting an FC port update. Event status is reported, as are the contents of FC processor mailbox 1, 2, and 3 registers.

Error log messages

The following sections list and describe, by reporting module, the error log messages.

Application modules

The error log messages provided by application modules are listed in Table 24 and described in this section.

Table 24 Application module—error log messages

ID	Log message	Message Number	Description
40967	QLBA_NullDoorbell: driver unloaded, port disabled	7	Null doorbell routine for unloaded drivers. When a driver is unloaded, the doorbell routine is redirected to this null routine.
40996	QLBA_ProcessTrb: Processing unsupported ordered tag command	36	Processing unsupported ordered-tag Task Management command.
41004	QLBA_ProcessTrb: Processing unsupported head of queue tag command	44	Processing unsupported head-of-queue Task Management command.
41058	QLBA_CreateTargetDeviceObject: Too many devices	98	Unable to create object for target device: exceeded maximum number of target devices.
41060	QLBA_CreateTargetNodeObject: Too many devices	100	Unable to create object for target node: exceeded maximum number of target devices.
41067	QLBA_CreateLUNObject: LUNObject memory unavailable	107	Memory unavailable for LUN object.
41077	QLBA_CreateInitiatorObject: Too many initiators	117	Unable to create object for initiator object: exceeded maximum number of initiators.
41096	QLBA_DisplayTargetOperationStatus: PCI Error, Status 0x%.2x	136	Process control block status indicates a PCI error during a target operation.
41106	QLBA_DisplayInitiatorOperationStatus: DMA Error, Status 0x%.2x	146	Process control block status indicates a DMA error during an initiator operation.
41107	QLBA_DisplayInitiatorOperationStatus: Transport Error, Status 0x%.2x	147	Process control block status indicates a transport error (protocol) during an initiator operation.
41111	QLBA_DisplayInitiatorOperationStatus: Data Overrun, Status 0x%.2x	151	Process control block status indicates a data overrun error during an initiator operation.
41353	QLIS_LoginPduContinue CHAP Validation Failure	393	CHAP validation failed during login.
41354	QLIS_LoginPduContinue Unexpected CHAP key detected	394	Unexpected CHAP key.
41508	QLBI_SetPortInfo: QLUT_AllocatePortalObject failed (PortType 0x%x, PortId 0x%x)	548	Failed to allocate object for "Set Port Info" IOCTL processing. PortType: 0 = FC, 1 = iSCSI. PortId: 0 = FC1 or iSCSI1(GE1), 1 = FC2 or iSCSI2 (GE2).
41768	QLBI_GetLUNList: REPORT LUNS command failed	808	Report LUNs command failed. The Report LUNs command was issued by the mpx100/100b as part of its discovery process.

ID	Log message	Message Number	Description
41769	QLBI_GetLUNList: REPORT LUNS command failed with CHECK CONDITION, SCSI STATUS 0x%02X	809	Report LUNs command failed with CHECK CONDITION status. The Report LUNs command was issued by the mpx100/100b as part of its discovery process.
41771	QLBI_GetLUNList: LUN allocation failed for LUNId %d	811	Failed to allocate LUN object: out of resources.
41626	QLBI_GetLUNInfo: INQUIRY failed, TPB status 0x%x	666	Inquiry command failed. The Inquiry command was issued by the mpx100/100b as part of its discovery process.
41629	QLBI_GetLUNInfo: QLBI_PassthruCommand failed for INQUIRY (page code 0x83)	669	Inquiry command for page 83 failed. The Inquiry command was issued by the mpx100/100b as part of its discovery process.
41635	QLBI_GetLUNInfo: QLBI_PassthruCommand failed for READ CAPACITY.	675	Read Capacity command failed. The Read Capacity command was issued by the mpx100/100b as part of its discovery process.
41636	QLBI_GetLUNInfo: READ CAPACITY failed, TPB status 0x%x	676	Read Capacity command failed. The Read Capacity command was issued by the mpx100/100b as part of its discovery process.
41696	QLBI_PassthruCommandCompletion: Passthru command aborted	736	Pass Through command issued by management application (such as GUI) was aborted.
41700	QLBI_Passthru: Invalid CDB length %d bytes	740	Pass Through command issued by management application (such as GUI) failed due to invalid CDB length.
41701	QLBI_Passthru: Invalid data length %d bytes	741	Pass Through command issued by management application (such as GUI) failed due to invalid data length.
41717	QLBI_PassthruCommand: command interrupted or timed out	757	Pass Through command issued by management application (such as GUI) was interrupted or timed out.
41750	QLBI_Ioctl: ERROR: Operation (0x%x) not supported in this mode	790	IOCTL operation unsupported. Operation code provided in log message.
41994	QLFC_Login: VpIndex (%d) out of range	1034	Login attempted using Fibre Channel VP (virtual port) index that is out of range (range = 0-31). Index reported in log message.
41995	QLFC_Login: VP Index 0x%x not configured	1035	Login attempted using Fibre Channel VP (virtual port) index which has not been configured. Operation attempted on an unconfigured VP.
42002	QLFC_Login: Cannot open connection	1042	Attempting login but Fibre Channel connection cannot be opened.
42024	QLFC_Logout: No active path to device. WWPN:%.2X%.2X%.2X%.2X%.2X%.2X%.2X%.2X	1064	Attempting logout of device for which there is no active path (WWPN not found).

ID	Log message	Message Number	Description
42027	QLFC_Logout: VP Index 0x%x not configured	1067	Logout attempted using Fibre Channel VP (virtual port) index which has not been configured. Operation attempted on an unconfigured VP.
42068	QLFC_HandleTeb: System Error	1108	Event notification: Fibre Channel processor encountered a system error (unrecoverable firmware error).
42069	QLFC_HandleTeb: Driver Fatal Error	1109	Event notification: Fibre Channel driver encountered a fatal error.
42072	QLFC_HandleTeb: FC Logout.	1112	Event notification: FC port logged out.
42242	QLIS_AllocateSessionObject: Out of session resources.	1282	Failed to allocate object for iSCSI session: out of session resources.
42252	QLIS_EnqueueiScsiPdu: Duplicate PDU, CmdSN %d (0x%x), dropping it.	1292	Received iSCSI PDU with duplicate CmdSN (command sequence number). Command PDU will be dropped.
42258	QLIS_InstantiateSession: Cannot add Initiator to the database	1298	Unable to allocate iSCSI Initiator object while instantiating session.
42259	QLIS_InstantiateSession: Maximum number (%d) of allowed hosts already logged in	1299	mpx100b ONLY. Exceeded the number of iSCSI hosts allowed to connect to mpx100.
42404	QLIS_ProcessStartTrb: [%d] CmdSN %ld is out of range (%ld—%ld), Cdb[0] 0x%02X, DataXferLen 0x%x.	1444	Failed to execute iSCSI command PDU due to its CmdSN (command sequence number) being out of range. The log message provides the incorrect CmdSN, the valid CmdSN range, the first byte of the CDB, and the data length.
41234	QLIS_LoginPduContinue: Operation failed. Initiator 0x%x, TPB status 0x%x	274	iSCSI login failed between receipt of PDU and request for the data segment.
41238	QLKV_ValidateLoginTransitCsgNsgVersion failed (status 0x%x)	278	iSCSI login failed due to unsupported version number in received login PDU.
41257	QLIS_LoginPduContinue: Invalid initiator name. Initiator:	297	iSCSI login PDU contains invalid initiator name. The format and character set used to form the initiator name are invalid.
41265	QLIS_LoginPduContinue: Target not configured for Portal.	305	iSCSI target login was attempted to a portal (iSCSI1 or iSCSI2) on which the target is not presented.
41267	QLIS_LoginPduContinue: Target not found. Target name:	307	iSCSI login PDU received for a target with a target name unknown to the mpx100/100b.
41268	QLIS_LoginPduContinue: Missing target name.	308	iSCSI login PDU received without a target name for a normal session.
41270	QLIS_LoginPduContinue: TSIH is 0 but InitiatorName key/value not provided.	310	iSCSI login PDU received without an initiator name key/value.

ID	Log message	Message Number	Description
41272	QLIS_LoginPduContinue: CONN_STATE_IN_LOGIN, Unknown InitTaskTag.	312	iSCSI login PDU received with an incorrect initiator task tag for a session which is partially logged in. This would occur if a login PDU other than the initial login PDU used an initiator task tag that was different from the initiator task tag provided in the initial login PDU.
41283	QLIS_LoginPduContinue: TSIH 0x%x out of range	323	iSCSI login PDU was received with a TSIH out of range. This would occur if the iSCSI Initiator attempting the login failed to used the TSIH value provided in the target login response PDU (the mpx100/100b is the target) in subsequent login PDUs.
41284	QLIS_LoginPduContinue: Session does not exist, invalid TSIH 0x%x.	324	iSCSI login PDU was received with an invalid TSIH value. The TSIH is invalid because there is no session with that TSIH value. This would occur if the iSCSI Initiator attempting the login failed to used the TSIH value provided in the target login response PDU (the mpx100/100b is the target) in subsequent login PDUs.
42648	QLIS_HandleTeb: Driver Fatal Error	1688	Event notification: iSCSI driver encountered a fatal error.
42649	QLIS_HandleTeb: Unload Driver.	1689	Event notification: an IOCTL request was received to unload the iSCSI driver.
42654	QLIS_HandleTeb: iSNS Connection Failed	1694	Event notification: an attempt to connect to the iSNS server failed.

iSCSI driver

The error log messages for iSCSI drier are common to both iSCSI ports. The messages are listed and described in Table 25. Log messages beginning with #0 apply to iSCSI port 1 (GE1) and log messages beginning with #1 apply to iSCSI port 2 (GE2).

Table 25 iSCSI driver—error log messages

ID	Log message	Message Number	Description
73990	#%d: QLUtmIoctlEnable: Initialize FW failed	262	The iSCSI processor failed firmware initialization.
74056	#%d: QLRunDiag: MBOX Diag test internal loopback failed %x %x	328	The iSCSI processor failed the internal loopback test.
74057	#%d: QLRunDiag: MBOX Diag test external loopback failed %x %x	329	The iSCSI processor failed the external loopback test.
74068	#%d: QLUtmReceiveScsiCmd: Invalid ATIO Continuation type %x	340	iSCSI FW did not send a valid Continuation IOCB.

ID	Log message	Message Number	Description
74069	#%d: QLUtmProcessResponseQueue: Immediate data addr %08x:%08x in unsupported PduType	341	Driver received an unsupported pdu type with immediate data address.
74241	#%d: QLiSNSEnableCallback: iSNS Server TCP Connect failed	513	The iSCSI processor was unable to connect with iSNS (iSCSI name server).
74577	#%d: QLIsrDecodeMailbox: NVRAM invalid	849	The iSCSI processor reported that the iSCSI port NVRAM (non-volatile memory) contains invalid data (checksum error).
74580	#%d: QLIsrDecodeMailbox: AEN %04x, Duplicate IP address detected, MB[1-5] %04x %04x %04x %04x %04x	852	Duplicate IP address is detected on iscsi port %d
74587	#%d: QLIsrDecodeMailbox: Link down	859	The iSCSI processor reported a link-down condition.
74620	#%d: QLProcessAen: Invalid event %x	892	Driver received an invalid event from iScsi FW.
74656	#%d: QLReadyTimer: Adapter missed heartbeat for %d seconds. Time left %d	928	The driver failed to receive a heartbeat from the iSCSI processor for the specified number of seconds.
74659	#%d: QLReadyTimer: Adapter missed heartbeat for 0x%x seconds.	931	Driver did not receive a heartbeat event from iScsi FW.
74661	#%d: QLTimer: Abort pTpb=%p, Type %x, Timeout 0x%x DrvCount 0x%x, DdbIndex 0x%x	933	The driver timed out an iSCSI processor operation and is aborting the operation.
74663	#%d: QLReadyTimer: MBOX_CMD %04x %04x %04x %04x %04x %04x %04x %04x timed out	935	The driver timed out an iSCSI processor mailbox command.
74665	#%d: QLReadyTimer: QLiSNSReenable failed	937	The driver timed out while attempting to reconnect with iSNS.
74705	#%d: QLProcessSystemError: Restart RISC	977	Driver detected an error that requires iSCSI FW to be restarted.
74746	#%d: QLInitializeFW: MBOX_CMD_INITIALIZE_FIRMWARE failed %04x %04x %04x %04x %04x %04x	1018	iScsi FW failed to initialize.
74784	#%d: QLUpdateInitiatorData: No more room in Initiator Database	1056	The driver's initiator database is full. The driver is capable of storing 1024 iSCSI Initiators in its database. Use the CLI or GUI to remove unwanted/unused iSCSI Initiators.
74800	#%d: QLSetTargetData: No more room in Target Database	1072	The driver's target database is full. Use the CLI or GUI to remove unwanted/unused iSCSI targets.

Fibre Channel driver

The Fibre Channel driver error log messages are listed and described in Table 26 and described in this section. Log messages beginning with #0 apply to FC port 1 (FC1) and log messages beginning with #1 apply to FC port 2 (FC2).

Table 26 FC driver—error log messages

ID	Log message	Message Number	Description
106583	#%d: QLUtmReceiveIo: Path invalid/FW No resource count %x	87	The FC processor has received a SCSI command for an unknown target path or has run out of resources to execute additional commands.
106589	#%d: QLIoctlEnable: Adapter disabled	93	The FC processor was disabled by an IOCTL request to the driver.
106590	#%d: QLIoctlEnable: Initialize FW error	94	The FC processor firmware failed initialization. The request to initialize was received by the driver in an IOCTL request.
106592	#%d: QLIoctlRunDiag: Diagnostic loopback command failed %x %x %x %x	96	The FC processor failed the external loopback test.
106593	#%d: QLIoctlDisable: Re-initialize adapter failed	97	The FC processor failed to reinitialize in response to an IOCTL disable request.
106803	#%d: QLIsrEventHandler: Link down (%x)	307	The FC processor reported a link-down condition.
106813	#%d: QLIsrEventHandler: Unexpected async event (%x), MB1=%x, MB2=%x, MB3=%x, MB4=%x, MB5=%x, MB6=%x, MB7=%x	317	The FC processor reported an unexpected asynchronous event. The mailbox registers provide status, event code, and data related to the event.
106851	#%d: QLTimer: Heartbeat failed	355	FC firmware failed to respond to a keep alive command. FC firmware will be restarted.
106853	#%d: QLTimer: Link error count (0x%x) exceeded, link down	357	The driver has determined that the FC link is unreliable and unusable, due to the number of errors encountered. The link has been taken down.
106912	#%d: QLReserveLoopId: out of loop Ids	416	The FC processor was unable to obtain the number of loop IDs required. This failure occurs only when the FC processor is running multi-ID firmware.
106928	#%d: QLMarkDeviceOffline: Device Id: %x marked offline, cLinkDownTimeout = %x, cPortDownRetryCount=%x	432	The driver was unable to reestablish connection to target within the time-out and retry counts and is therefore marking it offline.
106948	#%d: QLSnsGetAllNext: Name server login FAILED %x	452	The FC processor is unable to log into the FC fabric name server.

ID	Log message	Message Number	Description
107029	#%d: QLUpdateDeviceData: out of slots in host database	533	The drivers host (initiator) database is full.
107030	#%d: QLUpdateDeviceData: out of slots in target database	534	The drivers target database is full.
107041	#%d: QLUpdateDeviceDatabase 0x%x: GET_ID failed %x	545	The drivers host (initiator) database is full. Maximum host database = 64.
107056	#%d: QLUpdateDeviceDatabase 0x%x: out of slots in host database	560	The drivers host (initiator) database is full. Maximum host database = 64.
107078	#%d: QLUpdatePort 0x%x: out of slots in host database	582	The drivers host (initiator) database is full.

User modules

The error log messages for user modules are listed and described in Table 27.

Table 27 User modules—error log messages

ID	Log message	Message Number	Description
139265	QBRPC_Initialize: Entered	1	RPC (remote procedure call) server initialization entry point.
139266	QBRPC_Initialize:GetBridge Mem Allocation error	2	Get System API memory allocation failed.
139267	QBRPC_Initialize:GetBridgeAdv Mem Allocation error	3	Get System Advanced API memory allocation failed.
139268	QBRPC_Initialize:GetMgmt Mem Allocation error	4	Get Management API memory allocation failed.
139269	QBRPC_Initialize:GetIscsi Mem Allocation error	5	Get iSCSI API memory allocation failed.
139270	QBRPC_Initialize:GetIscsiAdv Mem Allocation error	6	Get iSCSI advanced API memory allocation failed.
139271	QBRPC_Initialize:GetIsns Mem Allocation error	7	Get iSNS API memory allocation failed.
139272	QBRPC_Initialize:GetFcIntfc Mem Allocation error	8	Get FC Interface API memory allocation failed.
139273	QBRPC_Initialize:GetFcAdv Mem Allocation error	9	Get FC Advanced API memory allocation failed.
139280	QBRPC_Initialize:GetFcSfp Mem Allocation error	16	Failed memory allocation for Get FC SFP API.
139281	QBRPC_Initialize:GetLog Mem Allocation error	17	Failed memory allocation for Get Log API.

ID	Log message	Message Number	Description
139282	QBRPC_Initialize:GetStats Mem Allocation error	18	Failed memory allocation for Get Statistics API.
139283	QBRPC_Initialize:InitListMem Allocation error	19	Failed memory allocation for Get Initiator List API.
139284	QBRPC_Initialize:TargetList Mem Allocation error	20	Failed memory allocation for Get Target List API.
139285	QBRPC_Initialize:LUNList Mem Allocation error	21	Failed memory allocation for Get LUN List API.
139286	QBRPC_Initialize:PresTarget Mem Allocation error	22	Failed memory allocation for Get Presented Targets List API.
139287	QBRPC_Initialize:LUNMask Mem Allocation error	23	Failed memory allocation for Get LUN Mask API.
139288	QBRPC_Initialize:Init Mem Allocation error	24	Failed memory allocation for Initiator API.
139289	QBRPC_Initialize:TgtDevice Mem Allocation error	25	Failed memory allocation for Target Device API.
139296	QBRPC_Initialize:FcTgt Mem Allocation error	32	Failed memory allocation for FC Target API.
139297	QBRPC_Initialize:BridgeStatus Mem Allocation error	33	Failed memory allocation for System Status API.
139298	QBRPC_Initialize:Diag Mem Allocation error	34	Failed memory allocation for Diagnostic API.
139299	QBRPC_Initialize:DiagLog Mem Allocation error	35	Failed memory allocation for Diagnostic Log API.
139300	QBRPC_Initialize:FruImage Mem Allocation error	36	Failed memory allocation for FRU Image API.
139301	QBRPC_Initialize:OemMfg Mem Allocation error	37	Failed memory allocation for OEM Manufacturing API.
139302	QBRPC_Initialize:Status Mem Allocation error	38	Failed memory allocation for Status API.
139303	QBRPC_Initialize:TcpIpStats Mem Allocation error	39	Failed memory allocation for TCP/IP Statistics API.
139304	QBRPC_Initialize:NtpStats Mem Allocation error	40	Failed memory allocation for NTP Status API.
139305	QBRPC_Initialize:LUNList Mem Allocation error	41	Failed memory allocation for LUN List API.
139315	QBRPC_FreeResources:Entered	51	RPC free resources entry point.
139553	checkDuplicateIp: Detected Error %08x %08x%04x	289	Detected duplicate IP address for management port.

ID	Log message	Message Number	Description
151842	FW Upgrade performed: new version is: %d.%d.%d.%d	290	Performed router firmware upgrade, new version number is d.d.d.d.
151843	REBOOT/SHUTDOWN Command from user. Code=%d	291	User performed a router reboot or shutdown.
151889	#%d: qapisetfcinterface-params_1_svc: FC port configuration changed	337	FC port configuration has been modified.
151890	#%d: qapisetiscsiinterface-params_1_svc: iSCSI port configuration changed	338	iSCSI port configuration has been modified.
151891	#%d: qapisetisns_1_svc:iSNS configuration changed	339	iSNS configuration has been modified.
151892	qapisetntpparams_1_svc: NTP configuration changed	340	NTP configuration has been modified.
151893	#%d: qapisetvlanparams_1_svc: VLAN configuration changed	341	VLAN configuration has been modified.
151894	qapisetlunmask_1_svc: Lunmask added for LUN %d	342	User presented a LUN to an initiator.
151895	qapisetlunmask_1_svc: Lunmask removed for LUN %d	343	User unpresented a LUN to an initiator
151896	qapisetmgmintfcparams_1_svc:Management port configuration changed	344	Management Ethernet port configuration has been modified.
151897	qapisetbridgebasicinfo_1_svc:Bridge configuration changed	345	Router configuration has been modified.
151908	GE%d: Port status changed by user to ENABLED.	356	User enabled GE (iSCSI) port %d.
158909	GE%d: Port status changed by user to DISABLED.	357	User disabled GE (iSCSI) port %d.
158910	FC%d: Port status changed by user to ENABLED.	358	User enabled FC port %d.
158911	FC%d: Port status changed by user to DISABLED	359	User disabled FC port %d.
152082	qapiaddmodifyinitiator_1_svc : Initiator Configuration Changed	530	Initiator configuration changed, such as CHAP settings or OS type.
152083	qapiremoveinitiator_1_svc : Initiator Removed	531	User removed an initiator from the router. Typically this is done using CLI "initiator rm" command.

System

The error log messages provided by system modules are listed and described in Table 28.

Table 28 System—error log messages

ID	Log message	Message Number	Description
237572	Failed to kill sys killer %d\n	4	Failed to kill system task.
237573	Temperature over high threshold %d	5	Reporting router exceeds maximum operating temperature.
249862	Temperature is back to normal range %d	6	The router temperature has returned to the normal operating range and is d (C).

Fatal log messages

The following sections list the fatal log messages by reporting module.

iSCSI driver

The fatal error log messages for iSCSI drivers are listed and described in Table 29. Log messages beginning with #0 apply to iSCSI port 1 (GE1) and log messages beginning with #1 apply to iSCSI port 2 (GE2).

Table 29 iSCSI driver—fatal log messages

ID	Log message	Message Number	Description
69652	#%d: qlutm_init: Diagnostic failed, invalid SRAM	20	iSCSI processor SRAM test failed.
69653	#%d: qlutm_init: Diagnostic failed, fail reboot	21	iSCSI processor failed diagnostic reboot.
69654	#%d: qlutm_init: Diagnostic failed, invalid NVRAM	22	iSCSI processor failed NVRAM diagnostic.
69655	#%d: qlutm_init: Diagnostic failed, invalid DRAM	23	iSCSI processor failed DRAM diagnostic.
69656	#%d: qlutm_init: Failed to return diagnostic result to Bridge	24	iSCSI processor failed to return diagnostic result.
69941	#%d: QLUtmProcessResponseQueue: Invalid handle %x EntryType %x	309	Response queue entry contains invalid handle.
69951	#%d: QLSetNvram: QLRebootTimer failed AF %x RS %x Time %d	319	Set NVRAM reboot timer failed.
69964	#%d: QLDisable: QLRebootTimer failed AF %x RS %x Time %d	332	Port disable reboot timer failed.

ID	Log message	Message Number	Description
69966	#%d: QLEnable: QLRebootTimer failed AF %x RS %x Time %d	334	Port enable reboot timer failed.
70224	#%d: QLProcSrblessiSNSResponse: Invalid handle %x	592	iSNS response contains invalid handle.
70400	#%d: QLInitializeDevice: QLStartAdapter failed	768	Start iSCSI processor failed.
70417	#%d: QLInitializeAdapter: QLInitializeFW failed	785	iSCSI processor firmware initialization failed.
70432	#%d: QLDoInterruptServiceRoutine: PortFatal interrupt. PortFatalErrorStatus %08x CSR %08x AS %x AF %x	800	iSCSI processor port:fatal error.
70448	#%d: QLStartAdapter: QLRebootTimer failed AF %x RS %x Time %d	816	Start iSCSI processor reboot timer failed.
70489	#%d: QLIsrDecodeMailbox: System Error 8002 MB[1-7] %04x %04x %04x %04x %04x %04x %04x	857	iSCSI processor:fatal system error.
70499	#%d: QLProcessResponseQueue: Invalid handle for ET_PASSTHROUGH_STATUS	867	Response queue invalid handle for ET passthrough.
70501	#%d: QLProcessResponseQueue: Invalid entry type in response queue %x	869	Response queue invalid entry type.
70502	#%d: QLProcessResponseQueue: Invalid handle %x EntryType %x	870	Response queue invalid handle for specified entry type.
70524	#%d: QLProcessAen: Invalid event %x	892	Asynchronous event for unknown event type.
70544	#%d: QLRebootTimer: Reboot failed!	912	Reboot timer failed.
70563	#%d: QLReadyTimer: Adapter missed heartbeat for 0x%x seconds. Rebooting	931	iSCSI driver missed iSCSI processor heartbeat. iSCSI processor rebooted.
70564	#%d: QLReadyTimer: Abort pTpb=%p failed, DrvCount 0x%x	932	iSCSI processor failed to complete operation before time-out.
70609	#%d: QLProcessSystemError: Restart RISC	977	iSCSI processor: system error restart
70610	#%d: QLProcessSystemError: RebootHba failed	978	iSCSI processor reboot failed.
70784	#%d: QLConfigChip: invalid NVRAM	1152	iSCSI processor NVRAM invalid (checksum error).
70835	#%d: QLStartFw: MBOX_CMD_SET_FLASH failed %x	1203	iSCSI FLASH (NVRAM) command failed.
70836	#%d: QLStartFw: Invalid Fw loader state 0x%x	1204	iSCSI firmware loader invalid state.

ID	Log message	Message Number	Description
70837	#%d: QLStartFw: Load Fw loader timeout	1205	iSCSI failed to load firmware in time allotted.

FC driver

The fatal log messages are listed and described in Table 30. Log messages beginning with #0 apply to FC port 1 (FC1) and log messages beginning with #1 apply to FC port 2 (FC2).

Table 30 FC driver—fatal log messages

ID	Log message	Message Number	Description
102419	#%d: qlutm_init: Diagnostic failed, port 1 invalid SRAM	19	FC1 processor SRAM test failed.
102420	#%d: qlutm_init: Diagnostic failed, port 1 POST failed	20	FC1 processor POST (power-on self-test) failed.
102421	#%d: qlutm_init: Diagnostic failed, port 2 invalid SRAM	21	FC2 processor SRAM test failed.
102422	#%d: qlutm_init: Diagnostic failed, port 2 POST failed	22	FC2 processor POST failed.
102423	#%d: qlutm_init: Failed to return diagnostic result to Bridge	23	FC processor failed to return diagnostic results.
102656	#%d: QLInitializeAdapter: Reset ISP failed	256	FC processor failed reset.
102657	#%d: QLInitializeAdapter: Load RISC code failed	257	FC processor firmware load failed.
102658	#%d: QLInitializeAdapter: Load ISP2322 receive sequencer code failed	258	FC processor receive sequencer code load failed.
102659	#%d: QLInitializeAdapter: Load ISP2322 transmit sequencer code failed	259	FC processor transmit sequencer code load failed.
102662	#%d: QLInitializeAdapter: Verify Checksum command failed (%x)	262	FC processor firmware checksum failed.
102680	#%d: QLInitializeFW: FAILED	280	FC processor firmware initialization failed.
102688	#%d: QLInterruptServiceRoutine: Risc pause %x with parity error hccr %x, Disable adapter	288	FC processor paused due to internal parity error.
102689	#%d: QLInterruptServiceRoutine: Invalid interrupt status: %x	289	FC processor returned invalid interrupt status.
102716	#%d: QLIsrEventHandler: System error event (%x), MB1=%x, MB2=%x, MB3=%x, MB4=%x, MB5=%x, MB6=%x, MB7=%x	316	FC processor system error.

ID	Log message	Message Number	Description
102746	#%d: QLProcessResponseQueue: Invalid handle %x, type %x	346	Response queue entry contains invalid handle.
102752	#%d: QLTimer: Ext Ram parity error exceed limit cnt 0x%x, limit 0x%x, Disabled adapter	352	FC processor external SRAM parity error count exceeded limit: FC port disabled.
102755	#%d: QLTimer: Heartbeat failed	355	FC processor heartbeat failed.
102800	#%d: QLRestartRisc: restart RISC	400	FC processor being restarted.

System

The fatal log messages for system modules are listed and described in Table 31.

Table 31 System—fatal log messages

ID	Log message	Message Number	Description
233473	memory monitor: Detected Uncorrectable Ecc %08lx system is rebooting in 5 secs\n	1	Uncorrectable memory error detected at address provided in log message.
233474	Failed to register interrupt handler!\n	2	Attempt to register interrupt handler failed.
233475	%s class_simple_create failed\n	3	Failed `class_simple_create` system call from memory monitor initialization routine.

D Simple Network Management Protocol

SNMP provides monitoring and trap functions for managing the router through third-party applications that support SNMP. The mpx100/100b firmware supports SNMP versions 1 and 2 and an HP MIB "Management Information Base (MIB)" on page 196. Traps can be formatted using SNMP versions 1 or 2 "Notifications" on page 204.

This appendix contains the following sections:

- SNMP properties, page 195
- SNMP trap configuration, page 196
- Management Information Base (MIB), page 196
- Notifications, page 204

SNMP properties

The SNMP properties can be set using either the CLI or the GUI. Table 32 describes the SNMP properties.

Table 32 SNMP properties

Parameter	Description
Read Community	Read community password that authorizes an SNMP management server to read information from the router. This is a write-only field. The value on the router and the SNMP management server must be the same. The read community password can be up to 32 characters excluding #, semicolon (;), and comma (,). The default is `public`.
Trap Community	Trap community password that authorizes an SNMP management server to receive traps. This is a write-only field. The value on the router and the SNMP management server must be the same. The trap community password can be up to 32 characters excluding #, semicolon (;), and comma (,). The default is `public`.
System Location	Specifies the name of the router location. The name can be up to 64 characters excluding #, semicolon (;), and comma (,). The default is undefined.
System Contact	Specifies the name of the person to be contacted to respond to trap events. The name can be up to 64 characters excluding #, semicolon (;), and comma (,). The default is undefined.
Authentication Traps	Enables or disables the generation of authentication traps in response to authentication failures. The default is disabled.

SNMP trap configuration

SNMP trap configuration supports setting up to eight trap destinations. Choose from Trap 1 to Trap 8 to configure each trap. Table 33 describes the parameters for configuring an SNMP trap.

Table 33 SNMP parameters

Parameter	Description
Trap *n* Enabled	Enables or disables trap *n*. If disabled, the trap is not configured.
Trap Address[1]	Specifies the IP address to which the SNMP traps are sent. A maximum of 8 trap addresses are supported. The default address for traps is 0.0.0.0.
Trap Port[1]	The port number on which the trap is sent. The default is 162.
Trap Version	Specifies the SNMP version (1 or 2) with which to format traps.

[1]Trap address (other than 0.0.0.) and trap port combinations must be unique. For example, if trap 1 and trap 2 have the same address, then they must have different port values. Similarly, if trap 1 and trap 2 have the same port value, they must have different addresses.

Management Information Base

The following sections describe the components of the Management Information Base (MIB):

- System information, page 196
- Network port table, page 197
- Fibre Channel port table, page 200
- Sensor table, page 202

System information

The system information objects provide the system serial number, version numbers (hardware/software/agent), and number of ports (FC/GE).

qsrSerialNumber

Syntax	`SnmpAdminString`
Access	read-only
Description	The system serial number

qsrHwVersion

Syntax	`SnmpAdminString`
Access	read-only
Description	The system hardware version number

qsrSwVersion

Syntax	`SnmpAdminString`
Access	read-only
Description	The system software (firmware) version number

qsrNoOfFcPorts

Syntax	`Unsigned32`
Access	read-only
Description	The number of FC ports on the system

qsrNoOfGbEPorts

Syntax	`Unsigned32`
Access	read-only
Description	The number of Gigabit Ethernet ports on the system

qsrAgentVersion

Syntax	`SnmpAdminString`
Access	read-only
Description	The version number of the agent software on the system

Network port table

A list of network ports that are operational on the router. The entries in this table include the management port and the iSCSI and TOE ports on the router. Note that a single Gigabit Ethernet port can function as an iSCSI port and a TOE simultaneously; thus, there may be up to two entries for a given Gigabit Ethernet port.

qsrNwPorttable

Syntax	`QsrNwPortEntry`
Access	not-accessible
Description	The entries in this table include the management port and the iSCSI and TOE ports on the router.

qsrNwPortEntry

Syntax	`QsrNwPortEntry`
Access	not-accessible
Description	Each entry (row) contains information about a specific network port.

QsrNwPortEntry

A network port entry consists of the following sequence of objects:

`qsrNwPortRole`	`QsrPortRole`
`qsrNwPortIndex`	`unsigned32`
`qsrNwPortAddressMode`	`INTEGER`
`qsrIPAddressType`	`InetAddressType`
`qsrIPAddress`	`InetAddress`
`qsrNetMask`	`InetAddress`
`qsrGateway`	`InetAddress`
`qsrMacAddress`	`MacAddress`
`qsrNwLinkStatus`	`QsrLinkStatus`
`qsrNwLinkRate`	`QsrLinkRate`

qsrNwPortRole

Syntax	`QsrPortRole`
Access	not-accessible
Description	The operational role of this port as, for example, a management port, an iSCSI port, or a TOE. A positive integer indexing each network port in a given role.

qsrNwPortIndex

Syntax	`Unsigned32`
Access	not-accessible
Description	A positive integer indexing each network port in a given role

qsrNwPortAddressMode

Syntax	`INTEGER 1 - Static 2 - DHCP 3 - Bootp 4 - RARP`
Access	read-only
Description	The method the port uses tot get its IP address.

qsrIPAddressType

Syntax	*InetAddressType*
Access	read-only
Description	The type of the IP address, for example, ipv4 or ipv6.

qsrIPAddress

Syntax	`InetAddress`
Access	read-only
Description	The IP address of the port

qsrNetMask

Syntax	`InetAddress`
Access	read-only
Description	The subnet mask of the port

qsrGateway

Syntax	`InetAddress`
Access	read-only
Description	The gateway for this port

qsrMacAddress

Syntax	`IMacAddress`
Access	read-only
Description	The Apple Macintosh address for this port

qstNwLinkStatus

Syntax	`QsrLinkStatus`
Access	read-only
Description	The operational link for this port

qsrNwLinkRate

Syntax	`QsrLinkRate`
Access	read-only
Description	The operational link rate for this port

FC port table information

The Fibre Channel port table lists the FC ports on the router, the sequence of objects in a port entry, and the port's role, index, physical address, port type, link status, and rate.

qsrFcPortTable

Syntax	`QsrFcPortEntry`
Access	not-accessible
Description	A list of the FC ports on the router. There are as many entries in this table as there are FC ports on the router.

qsrFcPortEntry

Syntax	`QsrFcPortEntry`
Access	not-accessible
Description	Each entry (row) contains information about a specific FC port.

QsrFcPortEntry

An FC port entry consists of the following sequence of objects:

`qsrFcPortRole`	`QsrPortRole`
`qsrFcPortIndex`	`Unsigned32`
`qsrFcPortNodeWwn`	`PhysAddress`
`qsrFcPortWwn`	`PhysAddress`

qsrFcPortId	PhysAddress
qsrFcPortType	Unsigned32
qsrFcLinkStatus	QsrLinkStatus
qsrFcLinkRate	QsrLinkRate

qsrFcPortRole

Syntax	QsrPortRole
Access	not-accessible
Description	The operational role of this port (that is in FCP mode or in frame shuttle mode)

qsrFcPortIndex

Syntax	Unsigned32
Access	not-accessible
Description	A positive integer indexing each FC port in a given role

qsrFcPortNodeWwn

Syntax	PhysAddress
Access	read-only
Description	The WWN of the node that contains this port

qsrFcPortWwn

Syntax	PhysAddress
Access	read-only
Description	The WWN for this port

qsrFcPortId

Syntax	PhysAddress
Access	read-only
Description	The interface's 24-bit Fibre Channel address identifier

qsrFcPortType

Syntax	`Unsigned32`
Access	read-only
Description	The type of FC port, as indicated by the use of the appropriate value assigned by IANA. The IANA-maintained registry for FC port types is at http://www.iana.org/assignments/fc-por)t-types.

qsrFcLinkStatus

Syntax	`QsrLinkStatus`
Access	read-only
Description	The current link status for this port

qsrFcLinkRate

Syntax	`QsrLinkRate`
Access	read-only
Description	The current link rate for this port

Sensor table

The Sensor table lists all sensors on the router and their type, unit of measure, current value, upper and lower thresholds, and sensor state.

qsrSensorTable

Syntax	`QsrSensorEntry`
Access	not-accessible
Description	A list of all the sensors on the router. There are as many entries (rows) in this table as there are sensors.

qsrSensorEntry

Syntax	`QsrSensorEntry`
Access	not-accessible
Description	Each entry (row) corresponds to a single sensor.

QsrSensorEntry

A sensor entry consists of the following sequence of objects:

qsrSensorType	INTEGER
qsrSensorIndex	Unsigned32
qsrSensorUnits	INTEGER
qsrSensorValue	Integer32
qsrUpperThreshold	Integer32
qsrLowerThreshold	Integer32
qsrSensorState	INTEGER

qsrSensorType

Syntax	INTEGER temperature = 1
Access	not-accessible
Description	The type of data being measured by this sensor

qsrSensorIndex

Syntax	Unsigned32
Access	not-accessible
Description	A positive integer identifying each sensor of a given type

qsrSensorUnits

Syntax	INTEGER celsius = 1
Access	read-only
Description	The unit of measurement for the sensor

qsrSensorValue

Syntax	Integer32
Access	read-only
Description	The current value of the sensor

qsrUpperThreshold

Syntax	`Integer32`
Access	read-only
Description	The upper-level threshold for this sensor.

qsrLowerThreshold

Syntax	`Integer32`
Access	read-only
Description	The lower-level threshold for this sensor

qsrSensorState

Syntax	`INTEGER`
Access	read-only
Description	The state of this sensor, indicating the health of the system. • `unknown`—The sensor value/threshold cannot be determined. • `normal`—The sensor value is within normal operational limits. • `warning`—The sensor value is approaching a threshold. • `critical`—The sensor value has crossed a threshold.

Notifications

The router provides six notification types. The following sections describe these notifications and the objects they use:

- Notification objects, page 204
- Agent startup notification, page 205
- Agent shutdown notification, page 205
- Network port down notification, page 205
- Fibre Channel port down notification, page 206
- Sensor notification, page 206
- Generic notification, page 206

Notification objects

This section defines the objects used in notifications.

qsrEventSeverity

Syntax	`INTEGER`
Access	accessible-for-notify
Description	This indicates the severity of the event. The value `clear` is used to specify that a condition that caused an earlier trap is not present now.

qsrEventDescription

Syntax	`SnmpAdminString`
Access	accessible-for-notify
Description	A description of the event that occurred

qsrEventTimeStamp

Syntax	`DateAndTime`
Access	accessible-for-notify
Description	When the event occurred

Agent startup notification

Indicates that the agent on the router has started running.

`qsrAgentStartup`—Uses the following object:

- `qsrEventTimeStamp`

Agent shutdown notification

Indicates that the agent on the router is shutting down.

`qsrAgentShutdown`—Uses the following object:

- `qsrEventTimeStamp`

Network port down notification

Indicates that the specified network port is down. If the port comes up thereafter, this event is sent with the `qsrEventSeverity` object set to `clear`.

`qsrNwPortDown`—Uses the following object:

- `qsrNwLinkStatus`
- `qsrEventTimeStamp`
- `qsrEventSeverity`

FC port down notification

Indicates that the specified FC port is down. If the port comes up thereafter, this event is sent with the `qsrEventSeverity` object set to `clear`.

`qsrFcPortDown`—Uses the following object:

- `qsrFcLinkStatus`
- `qsrEventTimeStamp`
- `qsrEventSeverity`

Sensor notification

Indicates that the state for the specified sensor is not normal. Once the sensor goes back to normal, this event is sent with the `qsrEventSeverity` object set to `clear`.

`qsrSensorNotification`—Uses the following object:

- `qsrSensorValue`
- `qsrSensorState`
- `qsrEventTimeStamp`
- `qsrEventSeverity`

Generic notification

Reports events other than the defined event types. It provides a description object that identifies the event.

`qsrGenericEvent`—Uses the following object:

- `qsrEventTimeStamp`
- `qsrEventSeverity`
- `qsrEventDescription`

E Setting up authentication

Challenge Handshake Authentication Protocol (CHAP) is an authentication protocol used for secure logon between the iSCSI Initiator and iSCSI target. CHAP uses a challenge-response security mechanism for verifying the identity of an initiator without revealing a secret password that is shared by the two entities. It is also referred to as a three-way handshake. An important concept of CHAP is that the initiator must prove to the target that it knows a shared secret without actually revealing the secret. (Sending the secret across the wire could reveal it to an eavesdropper.) CHAP provides a mechanism for doing this.

NOTE:

Setting up authentication for your iSCSI devices is optional. If you require authentication, HP recommends that you configure it after you have properly verified installation and operation of the iSCSI implementation without authentication.

In a secure environment, authentication may not be required, access to the targets is limited only to trusted initiators.

In a less secure environment, the target cannot determine if a connection request is truly from a given host. In that case, the target can use CHAP to authenticate an initiator.

When an initiator contacts a target that uses CHAP, the target (called the authenticator) responds by sending the initiator a challenge. The challenge is a piece of information that is unique for this authentication session. The initiator then encrypts this information, using a previously-issued password that is shared by both initiator and target. The encrypted information is then returned to the target. The target has the same password and uses it as a key to encrypt the information it originally sent to the initiator. It compares its results with the encrypted results sent by the initiator. If they are the same, the initiator is assumed to be authentic

These schemes are often called *proof of possession* protocols. The challenge requires that an entity prove possession of a shared key or one of the key pairs in a public key scheme.

This procedure is repeated throughout the session to verify that the correct initiator is still connected. Repeating these steps prevents someone from stealing the initiator's session by replaying information that was intercepted on the line.

There are several Internet RFCs that cover CHAP in more detail:

- RFC 1994 (PPP Challenge Handshake Authentication Protocol, August 1996)
- RFC 2433 (Microsoft PPP CHAP Extensions, October 1998)
- RFC 2759 (Microsoft PPP CHAP Extensions version 2, January 2000)

This appendix contains the following sections:

- CHAP restrictions, page 208
- Enabling single direction CHAP during discovery and normal session, page 209
- Enabling single direction CHAP during discovery and bi-directional CHAP during normal session, page 212
- Enabling bi-directional CHAP during discovery and single CHAP during normal session, page 214

- Enabling bi-directional CHAP during discovery and bi-directional CHAP during normal session, page 216

CHAP restrictions

The mpx100/100b CHAP secret restrictions

- Maximum length of 100 characters.
- Minimum length of 1 character.
- No restriction on the type of characters that can be entered.

Microsoft Initiator CHAP secret restrictions

- Maximum length of 16 characters.
- Minimum length of 12 characters.
- No restriction on the type of characters that can be entered.
- When an initiator uses iSNS for target discovery, only *normal* session CHAP applies.

Linux version 3.6.3 CHAP restrictions

CHAP setup with Linux iSCSI Initiator version 3.6.3 is not supported with the mpx100/100b because the Linux iSCSI driver omits CHAP security negotiations at login.

ATTO Macintosh Chap restrictions

The ATTO Macintosh iSCSI Initiator does not support CHAP at this time.

Recommended CHAP policies

- The same CHAP secret should not be configured for authentication of multiple initiators or multiple targets.
- Any CHAP secret used for initiator authentication must not be configured for the authentication of any target; and any CHAP secret used for target authentication must not be configured for authentication of any initiator.
- CHAP should be configured after the initial iSCSI Initiator/target login to validate initiator/target connectivity. The first initiator/target login also creates a discovered iSCSI Initiator entry on the mpx100/100b that will be used in the CHAP setup.

iSCSI session types

iSCSI defines two types of sessions:

- **Discovery**—SCSI discovery allows an initiator to find the targets to which it has access.
- **Normal operational session**—A normal operational session is unrestricted.

CHAP is enforced on both the discovery and normal operational session.

The mpx100/100b CHAP modes

The mpx100/100b supports two CHAP modes:

- **Single-direction**—The target authenticates the identity of the initiator with the user-provided CHAP secret. To enable single-direction CHAP, you need to enable CHAP for a specific initiator record on the mpx100/100b and input a corresponding CHAP secret from the iSCSI host.
- **Bidirectional**—The initiator and target authenticate identity of each other with the user-provided CHAP secrets. To enable bidirectional CHAP for a discovery session, you need to provide a CHAP secret for the initiator and for the iSCSI port for which you are performing discovery. To enable bidirectional CHAP for a normal session, you will need to provide a CHAP secret for the initiator and for the iSCSI-presented target that you are trying to log in to.

Once CHAP is enabled, it is enforced for both the normal and discovery sessions. You only have the choice of what type (single or bidirectional) of CHAP to perform:

- Single–direction CHAP during discovery and during normal session.
- Single–direction CHAP during discovery and bidirectional CHAP during normal session.
- bidirectional CHAP during discovery and single–direction CHAP during normal session.
- bidirectional CHAP during discovery and during normal session.

Enabling single–direction CHAP during discovery and normal session

Table 34 lists the parameters you use to enable single–direction CHAP.

Table 34 CHAP single direction settings

mpx100/100b secret settings		MS Initiator secret settings	
Source	**Setting (example)**	**Action**	**Setting (example)**
iSCSI Port	N/A	General Tab Secret	N/A
Discovered iSCSI Initiator	CHAPsecret01	Add Target Portal	CHAPsecret01
iSCSI Presented Target	N/A	Log on to Target	CHAPsecret01
NOTE: These are examples of secret settings. Configure CHAP with settings that apply to your specific network environment.			

1. Enable CHAP for the mpx100/100b discovered iSCSI Initiator entry. Select one of the following procedures depending upon the interface you are using:
   a. To enable CHAP for the mpx100/100b discovered iSCSI Initiator entry using HP StorageWorks mpx Manager:
      - If the iSCSI Initiator is not listed under Discovered iSCSI Initiators:
        i. Go to the Wizard menu and select the Add Initiator Wizard and enter the `iqn` name string.
        ii. Select the **Enable CHAP** check box.
        iii. Enter a CHAP secret. For example:
        `CHAPsecret01`
      - If the iSCSI Initiator is already listed under Discovered iSCSI Initiators:
        i. Select the initiator in the left-hand column of the Discovered ISCSI Initiator list.
        ii. Click the **Information** tab.

iii. Select the **Enable CHAP** check box.
iv. Enter a CHAP secret. For example:
`CHAPsecret01`

b. To enable CHAP for the mpx100/100b Discovered iSCSI Initiator entry using the mpx100/100b CLI:
- If the iSCSI Initiator is not listed under the `Show Initiators` command:
  i. Enter the `initiator add` command and add the iSCSI Initiator that is about to do discovery.
  ii. Enable CHAP and enter a CHAP secret. For example:
  `CHAPsecret01`
- If the iSCSI Initiator is already listed under the `Show Initiators` command:
  i. Enter the `initiator mod` command and select the iSCSI Initiator that is about to do discovery.
  ii. Enable CHAP and enter a CHAP secret. For example:
  `CHAPsecret01`

2. Enable CHAP for the Microsoft iSCSI Initiator:
a. Click **Discovery**.
- For manually discovering iSCSI target portals:
  i. Click **Add** under Target Portals.
  ii. Enter the IP address of the iSCSI port of the mpx100/100b.
  iii. Click **Advanced**.
  iv. Select the **CHAP Login Information** check box.
  v. Enter the CHAP secret for the mpx100/100b discovered iSCSI Initiator in the Target Secret box. For example:
  `CHAPsecret01`
  See "CHAP restrictions" on page 208 for more information on CHAP.
  vi. Click **OK** and the initiator completes Target discovery.
- Using iSNS for target discovery:
  i. Click **Add** under iSNS Servers.
  ii. Enter the IP address of the iSNS server.
  iii. Click **OK**.

b. Click **Targets**.
c. Select the appropriate target for login.
d. Click **Log On**.
e. Click **Advanced**.
f. Select the **CHAP Login Information** check box.
g. Enter the CHAP secret for the mpx100/100b discovered iSCSI Initiator in the Target Secret box.
h. Click **OK**.
i. Click **OK** and the initiator completes normal login.

Enabling CHAP for the mpx100/100b-discovered iSCSI initiator entry

To enable CHAP for the mpx100/100b-discovered iSCSI initiator entry using the HP StorageWorks mpx Manager

- If the iSCSI initiator is not listed under Discovered iSCSI Initiators:
  1. Go to the Wizard menu and select the **Add Initiator Wizard** and enter the `iqn` name string.
  2. Select the **Enable CHAP** checkbox.
  3. Enter a CHAP secret, for example, CHAPsecret01.
- If the iSCSI initiator is already listed under Discovered iSCSI Initiators:
  1. Select the initiator in the left-hand column of the Discovered iSCSI Initiator list.
  2. Select the **Information** tab.
  3. Select the **Enable CHAP** checkbox.
  4. Enter a CHAP secret, for example, CHAPsecret01.

To enable CHAP for the mpx100/100b–Discovered iSCSI Initiator entry using the mpx100/100b CLI:

- If the iSCSI initiator is not listed under the `show initiators` command:
  1. Issue the `initiator add` command and add the iSCSI initiator that is about to do discovery.
  2. Enable CHAP and enter a CHAP secret, for example CHAPsecret01.
- If the iSCSI initiator is already listed under the `show initiators` command:
  1. Issue the `initiator mod` command and select the iSCSI initiator that is to do discovery.
  2. Enable CHAP and enter a CHAP secret, for example CHAPsecret01.

Enable CHAP for the Microsoft iSCSI Initiator

1. Click **Discovery**.

   For manually discovering iSCSI target portals:

   a. Click **Add** under Target Portals.

   b. Enter the IP address of the iSCSI port of the mpx100/100b.

   c. Click **Advanced**.

   d. Select the CHAP Login Information checkbox.

   e. Enter the CHAP secret for the mpx100/100b–discovered iSCSI Initiator in the Target Secret box, for example, CHAPsecret01.

   f. Click **OK** and the initiator completes Target discovery.

   Using iSNS for target discovery:

   i. Click **Add** under iSNS Servers.

   ii. Enter the IP address of the iSNS server.

   iii. Click **OK**.
2. Click **Targets** and select the appropriate target for login.
3. Click **Log On** and then click **Advanced**.

4. Select the CHAP Login Information checkbox.
5. Enter the CHAP secret for the mpx100/100b–discovered iSCSI Initiator in the Target Secret box.
6. Click **OK** and then click **OK** again.

Enabling single–direction CHAP during discovery and bidirectional CHAP during normal session

Table 35 lists the parameters you need to enable single-direction CHAP during discovery and bidirectional CHAP during normal sessions.

Table 35 CHAP single and bidirectional settings

mpx100/100b secret settings		MS Initiator secret settings	
iSCSI Port	N/A	General Tab Secret	hpstorageworks
Discovered iSCSI Initiator	CHAPsecret01	Add Target Portal	CHAPsecret0
iSCSI Presented Target	hpstorageworks	Log on to Target	CHAPsecret01
NOTE: These are examples of secret settings. You must configure CHAP with settings that apply to your specific network environment.			

1. Enable CHAP for the mpx100/100b discovered iSCSI Initiator entry. Select one of the following procedures, depending upon the interface you are using:
   a. To enable CHAP for the mpx100/100b discovered iSCSI Initiator entry using HP StorageWorks mpx Manager:
      - If the iSCSI Initiator is not listed under Discovered iSCSI Initiators:
        i. Go to the Wizard menu and select the **Add Initiator** Wizard and enter the `iqn` name.
        ii. Select the **Enable CHAP** check box.
        iii. Enter a CHAP secret. For example:
        ```
        CHAPsecret01
        ```
      - If the iSCSI Initiator is already listed under Discovered iSCSI Initiators
        i. Select the initiator in the left-hand column of the Discovered ISCSI Initiator list.
        ii. Click the **Information** tab.
        iii. Select the **Enable CHAP** check box.
        iv. Enter a CHAP secret. For example:
        ```
        CHAPsecret01
        ```
   b. To enable CHAP for the mpx100/100b Discovered iSCSI Initiator entry using the mpx100/100b CLI:
      - If the iSCSI Initiator is not listed under the `Show Initiators` command:
        i. Enter the `initiator add` command and add the iSCSI Initiator that is about to do discovery.
        ii. Enable CHAP and enter a CHAP secret. For example:
        ```
        CHAPsecret01
        ```

- If the iSCSI Initiator is already listed under the `Show Initiators` command:
  i. Enter the `initiator mod` command and select the iSCSI Initiator that is about to do discovery.
  ii. Enable CHAP and enter a CHAP secret. For example:
  `CHAPsecret01`

2. Enable CHAP for the mpx100/100b iSCSI presented target:
   - To enable CHAP for the mpx100/100b Discovered iSCSI Initiator entry using the HP StorageWorks mpx Manager:
     a. Select the iSCSI Presented Target the initiator will log in to.
     b. Click the **Information** tab.
     c. Select the **Enable CHAP** check box.
     d. Enable CHAP and enter a CHAP secret. For example:
     `hpstorageworks`
   - To enable CHAP for the mpx100/100b Discovered iSCSI Initiator entry using the mpx100/100b CLI:
     a. Enter the `set CHAP` command.
     b. Select the Presented Target the initiator will log in to.
     c. Enable CHAP and enter a CHAP secret. For example:
     `hpstorageworks`

3. Enable CHAP for the Microsoft iSCSI Initiator.
   a. Click the **General** tab.
   b. Click **Secret** in the middle of the screen.
   c. Click **Reset**.
   d. Enter the mpx100/100b iSCSI Presented Target CHAP secret. For example:
   `hpstorageworks`
   e. Click **Discovery**.
      - For manually discovering iSCSI target portals:
        i. Click **Add** under Target Portals.
        ii. Enter the IP address of the iSCSI port of the mpx100/100b.
        iii. Click **Advanced**.
        iv. Select the **CHAP Login Information** check box.
        v. Enter the CHAP secret for the mpx100/100b discovered iSCSI Initiator in the Target Secret box. For example:
        `CHAPsecret01`
        vi. Click **OK** and the initiator completes target discovery.
      - Using iSNS for target discovery:
        i. Click **Add** under iSNS Servers.
        ii. Enter the IP address of the iSNS server.
        iii. Click **OK**.
   f. Click **Targets**.
   g. Select the appropriate target for login.
   h. Click **Log On**.

i. Click **Advanced**.
j. Select the **CHAP Login Information** check box.
k. Enter the CHAP secret for the mpx100/100b discovered iSCSI Initiator in the Target Secret box. For example:

```
CHAPsecret01
```

l. Select the **Mutual Authentication** check box.
m. Click **OK**.
n. Click **OK** and the initiator completes normal login.

Enabling bi–directional CHAP during discovery and single–direction CHAP during normal session

Table 36 lists the parameters you need to enable single-direction CHAP during discovery and bidirectional CHAP during normal session.

Table 36 CHAP bidirectional and single settings

mpx100/100b secret settings		MS Initiator secret settings	
iSCSI Port	hpstorageworks	General Tab Secret	Hpstorageworks
Discovered iSCSI Initiator	CHAPsecret01	Add Target Portal	CHAPsecret01
iSCSI Presented Target	N/A	Log on to Target	CHAPsecret01

NOTE:

The above secret settings are for example only. Please configure CHAP with settings that apply to your specific network environment.

1. Enable CHAP for the mpx100/100b Discovered iSCSI Initiator entry. Select one of the following procedures, depending upon the interface you are using:
   a. To enable CHAP for the mpx100/100b Discovered iSCSI Initiator entry using HP StorageWorks mpx Manager:
      - If the iSCSI Initiator is not listed under Discovered iSCSI Initiators:
        i. Go to the Wizard menu and select the **Add Initiator** Wizard and enter the `iqn` name string.
        ii. Select the **Enable CHAP** check box.
        iii. Enter a CHAP secret. For example:

```
CHAPsecret01
```

      - If the iSCSI Initiator is already listed under Discovered iSCSI Initiators:
        i. Select the Initiator in the left-hand column of the Discovered ISCSI Initiator list.
        ii. Click the **Information** tab.
        iii. Select the **Enable CHAP** check box.
        iv. Enter a CHAP secret. For example:

```
CHAPsecret01
```

   b. To enable CHAP for the mpx100/100b Discovered iSCSI Initiator entry using the mpx100/100b CLI:

- If the iSCSI Initiator is not listed under the `Show Initiators` command:
  i. Enter the `initiator add` command and add the iSCSI Initiator that is about to do discovery.
  ii. Enable CHAP and enter a CHAP secret. For example:
  `CHAPsecret01`
- If the iSCSI Initiator is already listed under the `Show Initiators` command:
  i. Enter the `initiator mod` command and select the iSCSI Initiator that is about to do discovery.
  ii. Enable CHAP and enter a CHAP secret. For example:
  `CHAPsecret01`

2. Enable CHAP for the mpx100/100b iSCSI port:
   - To enable CHAP for the mpx100/100b iSCSI port using the HP StorageWorks mpx Manager:
     a. Select the appropriate iSCSI port number.
     b. Click **Advanced Configuration**.
     c. Select the **Enable CHAP** check box.
     d. Enter a CHAP secret. For example:
     `hpstorageworks`
   - To enable CHAP for the mpx100/100b iSCSI port using the mpx100/100b CLI:
     a. Enter the `set iscsi` *`portnumber`* command.
     b. Select the Presented Target the initiator will log in to.
     c. Select the **BiDi Discovery CHAP** check box.
     d. Enter a CHAP secret. For example:
     `hpstorageworks`

3. Enable CHAP for the Microsoft iSCSI Initiator.
   a. Click the **General** tab.
   b. Click **Secret** in the middle of the screen.
   c. Click **Reset**.
   d. Enter the mpx100/100b iSCSI Presented Target CHAP secret. For example:
   `hpstorageworks`
   e. Click **OK**.
   f. Click **Discovery**.
      - For manually discovering iSCSI target portals:
        i. Click **Add** under Target Portals.
        ii. Enter the IP address of the iSCSI port of the mpx100/100b.
        iii. Click **Advanced**.
        iv. Select the **CHAP Login Information** check box.
        v. Enter the CHAP secret for the mpx100/100b discovered iSCSI Initiator in the Target Secret box. For example:
        `CHAPsecret01`
        vi. Select the **Mutual Authentication** check box.
        vii. Click **OK**.
        viii. Click **OK** and the initiator completes Target discovery.

- Using iSNS for Target discovery:
  i. Click **Add** under iSNS Servers.
  ii. Enter the IP address of the iSNS server.
  iii. Click **OK**.

g. Click **Targets**.
h. Select the appropriate target for login.
i. Click **Log On**.
j. Click **Advanced**.
k. Select the **CHAP Login Information** check box.
l. Enter the CHAP secret for the mpx100/100b discovered iSCSI Initiator in the Target Secret box. For example:

```
CHAPsecret01
```

m. Select the **Mutual Authentication** check box.
n. Click **OK**.
o. Click **OK** and the initiator completes normal login.

Enabling bidirectional CHAP during discovery and bidirectional CHAP during normal session

Table 37 lists the parameters you need to enable bi–directional CHAP during discovery and bidirectional CHAP during normal session.

Table 37 CHAP bidirectional and bidirectional settings

mpx100/100b secret settings		MS Initiator secret settings	
iSCSI Port	hpstorageworks	General Tab Secret	Hpstorageworks
Discovered iSCSI Initiator	CHAPsecret01	Add Target Portal	CHAPsecret01
iSCSI Presented Target	hpstorageworks	Log on to Target	CHAPsecret01
NOTE: These are examples of secret settings. You must configure CHAP with settings that apply to your specific network environment.			

1. Enable CHAP for the mpx100/100b Discovered iSCSI Initiator entry. Select one of the following procedures, depending upon the interface you are using:
   a. To enable CHAP for the mpx100/100b Discovered iSCSI Initiator entry using HP StorageWorks mpx Manager:
      - If the iSCSI Initiator is not listed under Discovered iSCSI Initiators:
        i. Go to the Wizard menu and select the **Add Initiator** Wizard and enter the `iqn` name.
        ii. Select the **Enable CHAP** check box.
        iii. Enter a CHAP secret. For example:

```
CHAPsecret01
```

      - If the iSCSI Initiator is already listed under Discovered iSCSI Initiators:

i. Select the Initiator in the left-hand column of the Discovered ISCSI Initiator list.
ii. Click the **Information** tab.
iii. Select the **Enable CHAP** check box.
iv. Enter a CHAP secret. For example:

```
CHAPsecret01
```

b. To enable CHAP for the mpx100/100b Discovered iSCSI Initiator entry using the mpx100/100b CLI:
- If the iSCSI Initiator is not listed under the `Show Initiators` command:
  i. Enter the `initiator add` command and add the iSCSI Initiator that is about to do discovery.
  ii. Enable CHAP and enter a CHAP secret. For example:

```
CHAPsecret01
```

- If the iSCSI Initiator is already listed under the `Show Initiators` command:
  i. Enter the `initiator mod` command and select the iSCSI Initiator that is about to do discovery.
  ii. Enable CHAP and enter a CHAP secret. For example:

```
CHAPsecret01
```

2. Enable CHAP for the mpx100/100b iSCSI port:
- To enable CHAP for the mpx100/100b iSCSI port using the HP StorageWorks mpx Manager:
  a. Select the appropriate iSCSI port number.
  b. Click **Advanced Configuration**.
  c. Select the **Enable CHAP** check box.
  d. Enter a CHAP secret. For example:

```
hpstorageworks
```

- To enable CHAP for the mpx100/100b iSCSI port using the mpx100/100b CLI:
  a. Enter the `set iscsi` *`portnumber`* command.
  b. Select the Presented Target the initiator will log in to.
  c. Select the **BiDi Discovery CHAP** check box.
  d. Enter a CHAP secret. For example:

```
hpstorageworks
```

3. Enable CHAP on the mpx100/100b iSCSI Presented Target.
a. Click the **General** tab.
b. Click **Secret** in the middle of the screen.
c. Click **Reset**.
d. Enter the mpx100/100b iSCSI Presented Target CHAP secret. For example:

```
hpstorageworks
```

e. Click **OK**.
f. Click **Discovery**.
- For manually discovering iSCSI target portals:
  i. Click **Add** under Target Portals.
  ii. Enter the IP address of the iSCSI port of the mpx100/100b.

iii. Click **Advanced**.
iv. Select the **CHAP Login Information** check box.
v. Enter the CHAP secret for the mpx100/100b discovered iSCSI Initiator in the Target Secret box. For example:

```
CHAPsecret01
```

vi. Select the **Mutual Authentication** check box.
vii. Click **OK**.
viii. Click **OK** and the initiator completes target discovery.

- Using iSNS for target discovery:
  i. Click **Add** under iSNS Servers.
  ii. Enter the IP address of the iSNS server.
  iii. Click **OK**.

g. Click **Targets**.
h. Select the appropriate target for login.
i. Click **Log On**.
j. Click **Advanced**.
k. Select the **CHAP Login Information** check box.
l. Enter the CHAP secret for the mpx100/100b discovered iSCSI Initiator in the Target Secret box. For example:

```
CHAPsecret01
```

m. Select the **Mutual Authentication** check box.
n. Click **OK**.
o. Click **OK** and the initiator completes normal login.

F Saving and restoring the mpx100/100b configuration

The mpx100/100b configuration information is saved as a `.bin` or `.tgz` file, depending on the method used to restore the mpx100/100b persistent data. The mpx100/100b configuration information is saved and restored using the mpx Manager GUI or the mpx100/100b CLI commands. This appendix contains the following information:

- Saving the MPX100 configuration, page 219
- Restoring the MPX100 configuration, page 220

NOTE:

As with any important database, the mpx100/100b persistent data should be periodically saved to avoid data loss from hardware or software errors. It is also important to save the configuration information before replacing the mpx100/100b.

Saving the mpx100/100b configuration

Using the mpx100/100b GUI to save configuration information allows you to save the file to any location available to the server running the GUI.

Using the mpx100/100b CLI to save the configuration information places the file in the mpx100/100b's FTP directory. You must then move the file using FTP from the mpx100/100b.

Saving the configuration using the mpx100/100b GUI

To save the configuration using the mpx100/100b GUI:

1. Select **File > Save FRU**.
   The Save FRU dialog box is displayed.
2. Click **Save**.
3. Enter a file name and select a location to save to.

NOTE:

Do not change the Files of Type value.

4. Enter the password `config`, and then click **OK**.
   The configuration is saved to the selected location.

Saving the configuration using the mpx100/100b CLI

To save the configuration using the mpx100/100b CLI:

1. Log in to the mpx100/100b using a Telnet session to the management port or the console port.

   ```
   Username: guest
   Password: password
   ```

2. Enter the following command:

   ```
   mpx100> admin start
   ```

3. Enter `config` as the password.
4. Enter the following command:

   ```
   mpx100 (admin) #> fru save
   FRU save completed. Configuration File is HP_Storage-
   Works_mpx100_FRU.bin. Please use FTP to extract the file out from the
   System.
   mpx100 (admin) #>
   ```

NOTE:

The FRU save creates a `bin` file containing the router's persistent data, configuration, and LUN mappings. The file is stored in the routers `/var/ftp` directory. You must then FTP the `tar` file from the router.

5. Establish an FTP connection to the mpx100/100b management port and log in:

   ```
   Username: ftp
   Password: ftp
   ```

6. Enter the following command to set the FTP transfer type to Binary:

   ```
   ftp> bin
   ```

7. Enter the following command to access the `HP_StorageWorks_mpx100_FRU.bin` file:

   ```
   ftp> get HP_StorageWorks_mpx100_FRU.bin
   ```

Restoring the mpx100/100b configuration

There are two options for restoring configurations on the mpx100/100b:

- **Full Configuration Restore**—Fully restores the router's configuration (all configuration parameters and LUN mappings)
- **Partial Restore (Mappings)**—Restores only the LUN mappings

The restored configuration takes effect after the router is rebooted.

Restoring the configuration using the mpx100/100b GUI

To restore the configuration using the mpx100/100b GUI:

1. Select **File > Restore FRU**.
   The Restore FRU dialog box is displayed.

2. Click **Browse** and select the appropriate file name to restore.
3. Select **Full Configuration Restore** or **Partial Restore (Mappings)**.
4. Click **Start**.
   The Security Check dialog box is displayed.
5. Enter the password `config`, and then click **OK**.
6. Reboot the system for the configuration to take effect.

Restoring the configuration using the mpx100/100b CLI

To restore the configuration using the mpx100/100b CLI:

1. Establish an FTP connection to the mpx100/100b management port and log in:
   ```
   Username: ftp
   Password: ftp
   ```
2. Enter the following command to set the FTP transfer type to binary:
   ```
   ftp> bin
   ```
3. Enter the following command to put the `HP_StorageWorks_mpx100_FRU.bin` file:
   ```
   ftp> put HP_StorageWorks_mpx100_FRU.bin
   ```
4. Log in to the mpx100/100b using a Telnet session to the management port or console port.
   ```
   Username: guest
   Password: password
   ```
5. Enter the following command:
   ```
   mpx100> admin start
   ```
6. Enter `config` as the password.
7. Enter the following command:
   ```
   mpx100 (admin) #> fru restore
   A list of attributes with formatting and current values will follow.
   Enter a new value or simply press the Enter key to accept the current
   value. If you wish to terminate this process before reaching the end
   of the list press 'q' or 'Q' and the Enter key to do so. Type of restore
   (0=full, 1=mappings only) [full]
   FRU restore completed.
   ```
8. Reboot the system for the configuration to take effect.

G Regulatory compliance and safety

This appendix describes the following sections:

- Regulatory compliance, page 223
- Safety, page 226

Regulatory compliance

Federal Communications Commission notice for Class A equipment

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense. The end user of this product should be aware that any changes or modifications made to this equipment without the approval of Hewlett-Packard could result in the product not meeting the Class A limits, in which case the FCC could void the user's authority to operate the equipment.

Declaration of conformity for products marked with the FCC logo, United States only

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

For questions regarding your product, visit http://www.hp.com/.

For questions regarding this FCC declaration, contact us by mail or telephone:

- Hewlett-Packard Company
  P.O. Box 692000, Mailstop 510101
  Houston, TX 77269–2000
- 1–281–514–3333

To identify this product, refer to the part, Regulatory Model Number, or product number found on the product.

Modifications

The FCC requires the user to be notified that any changes or modifications made to this device that are not expressly approved by Hewlett-Packard Company may void the user's authority to operate the equipment.

Cables

Connections to this device must be made with shielded cables with metallic RFI/EMI connector hoods in order to maintain compliance with FCC Rules and Regulations.

Regulatory compliance identification numbers

For the purpose of regulatory compliance certifications and identification, your product has been assigned a unique Regulatory Model Number. The RMN can be found on the product nameplate label, along with all required approval markings and information. When requesting compliance information for this product, always refer to this RMN. The Regulatory Model Number should not be confused with the marketing name or model number of the product.

Laser device

All HP systems equipped with a laser device comply with safety standards, including International Electrotechnical Commission (IEC) 825. With specific regard to the laser, the equipment complies with laser product performance standards set by government agencies as a Class 1 laser product. The product does not emit hazardous light.

Laser safety warning

⚠ WARNING!

To reduce the risk of exposure to hazardous radiation:

- Do not try to open the laser device enclosure. There are no user-serviceable components inside.
- Do not operate controls, make adjustments, or perform procedures to the laser device other than those specified herein.
- Allow only HP authorized service technicians to repair the laser device.

Laser product label

The optional label, in Figure 77 or equivalent, may be located on the surface of the HP supplied laser device.

Figure 77 Class 1 laser product label

This optional label indicates that the product is classified as a CLASS 1 LASER PRODUCT. This label may appear on the laser device installed in your product.

International notices and statements

Canadian notice (avis Canadien)

Class A equipment

This Class A Digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

European Union notice

Products bearing the CE Marking comply with both the EMC Directive (89/336/EEC) and the Low Voltage Directive (73/23/EEC) issued by the Commission of the European Community and if this product has telecommunication functionality, the R&TTE Directive (1995/5/EC).

Compliance with these directives implies conformity to the following European Norms (the equivalent international standards and regulations are in parentheses):

- EN55022 (CISPR 22) – Electromagnetic Interference
- EN55024 (IEC61000-4-2, IEC61000-4-3, IEC61000-4-4, IEC61000-4-5, IEC61000-4-6, IEC61000-4-8, IEC61000-4-11) – Electromagnetic Immunity
- EN61000-3-2 (IEC61000-3-2) — Power Line Harmonics
- EN61000-3-3 (IEC61000-3-3) — Power Line Flicker
- EN60950 (IEC60950) — Product Safety
- Also approved under UL 60950/CSA C22.2 No. 60950–00, Safety of Information Technology Equipment.

BSMI notice

警告使用者:

這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。

Japanese notice

ご使用になっている装置にVCCIマークが付いていましたら、次の説明文をお読み下さい。

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラスB情報技術装置です。この装置は、家庭環境で使用することを目的としていますが、この装置がラジオやテレビジョン受信機に近接して使用されると、受信障害を引き起こすことがあります。
取扱説明書に従って正しい取り扱いをして下さい。

VCCIマークが付いていない場合には、次の点にご注意下さい。

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラスA情報技術装置です　この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

Korean notices

A급 기기 (업무용 정보통신기기)

이 기기는 업무용으로 전자파적합등록을 한 기기이오니 판매자 또는 사용자는 이 점을 주의하시기 바라며, 만약 잘못판매 또는 구입하였을 때에는 가정용으로 교환하시기 바랍니다.

B급 기기 (가정용 정보통신기기)

이 기기는 가정용으로 전자파적합등록을 한 기기로서 주거지역에서는 물론 모든지역에서 사용할 수 있습니다.

Safety

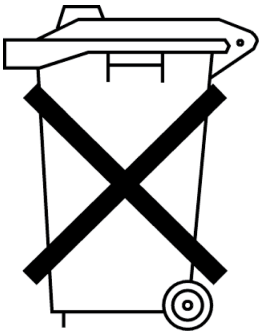
Battery replacement notice

Your switch is equipped with a lithium manganese dioxide, a vanadium pentoxide, or an alkaline internal battery or battery pack. There is a danger of explosion and risk of personal injury if the battery is incorrectly replaced or mistreated. Replacement is to be done by an HP authorized service provider using the HP spare part designated for this product. For more information about battery replacement or proper disposal, contact an HP authorized service provider.

⚠ WARNING!

Your switch contains an internal lithium manganese dioxide, a vanadium pentoxide, or an alkaline battery pack. There is risk of fire and burns if the battery pack is not properly handled. To reduce the risk of personal injury:

- Do not attempt to recharge the battery.
- Do not expose to temperatures higher than 60 °C (140 °F).
- Do not disassemble, crush, puncture, short external contacts, or dispose of in fire or water.
- Replace only with the HP spare part designated for this product.



Batteries, battery packs, and accumulators should not be disposed of together with the general household waste. To forward them to recycling or proper disposal, please use the public collection system or return them to HP, an authorized HP Partner, or their agents.

For more information about battery replacement or proper disposal, contact an HP authorized reseller or service provider.

Taiwan battery recycling notice

The Taiwan EPA requires dry battery manufacturing or importing firms in accordance with Article 15 of the Waste Disposal Act to indicate the recovery marks on the batteries used in sales, giveaway, or promotion. Contact a qualified Taiwanese recycler for proper battery disposal.

Power cords

The power cord set must meet the requirements for use in the country where the product was purchased. If the product is to be used in another country, purchase a power cord that is approved for use in that country.

The power cord must be rated for the product and for the voltage and current marked on the product electrical ratings label. The voltage and current rating of the cord should be greater than the voltage and current rating marked on the product. In addition, the diameter of the wire must be a minimum

of 1.00 mm2 or 18 AWG, and the length of the cord must be between 1.8 m, (6 ft) and 3.6 m (12 ft). If you have questions about the type of power cord to use, contact an HP authorized service provider.

NOTE:

Route power cords so that they will not be walked on and cannot be pinched by items placed upon or against them. Pay particular attention to the plug, electrical outlet, and the point where the cords exit from the product.

Japanese power cord statement

製品には、同梱された電源コードをお使い下さい。
同梱された電源コードは、他の製品では使用出来ません。

Glossary

CHAP	Challenge Handshake Authentication Protocol. An authentication technique for confirming the identity of one computer to another.
direct connect	A utility used to connect a server or mpx100/100b FC port directly to the EVA FC port without a the need for a Fibre Channel switch.
fabric connect	A utility used to connect a server or mpx100/100b FC port to a Fibre Channel switch to access the EVA FC ports.
GbE	Gigabit Ethernet Packet-based signaling technology that transmits data at throughput speeds of up to 1000 megabits per second (Mb/s), or1 Gigabit per second (Gb/s).
high availability	A system structure that keeps resources available when certain system components in the system fail.
Initiator	A device that starts an iSCSI transaction by issuing a command to another device (the iSCSI target).
IP	Internet Protocol The standard Internet protocol for moving packets of information from one computer to another. Commonly combined with TCP in the phrase TCP/IP.
IP SAN	A Storage Area Network (SAN) created using the Internet SCSI (iSCSI) protocol to connect servers and storage over a Gigabit Ethernet network.
IQN	iSCSI Qualified Name A name format for iSCSI that uniquely identifies every device in the world. For example: `iqn.5886.com.acme.tapedrive.sn-a12345678`.
iSCSI	Internet SCSI. An IP-based standard for linking data storage devices over a network and transferring data by carrying SCSI commands over IP networks.
iSCSI CRC	iSCSI cyclic redundancy check. A shortened cyclic code check used for error detection.
iSNS	Internet Storage Name Service A protocol designed to facilitate the automated discovery, management, and configuration of iSCSI and Fibre Channel devices on a TCP/IP network.
mpx100/100b	Serves as the iSCSI data transport that transfers data to and from the server and the storage system.
SCSI	small computer system interface. A parallel interface standard used to attach peripheral devices to computers.

Switch	An IP network communications device that routes packets (messages or fragments of messages) between nodes across virtual circuits.
teaming	The concept of multiple network adapters working together as a single network adapter.
target	An iSCSI device that executes a command from an iSCSI Initiator to perform some task.
TOE	TCP Offload Engine A piece of hardware that replaces a NIC and shifts TCP packet processing tasks from the server CPU to specialized TCP processors on the network adapter or storage device.
VLAN	virtual local area network. A network of computers that behave as if they are connected to the same wire even though they may actually be physically located on different segments of a LAN.
virtual network adapter	The concept of multiple network adapters working together as a single network adapter, also referred to as teaming.

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